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EDITORIAL NOTES.

German Coal, and Coal Contracts.

THERE was more talk last week on the subject of the purchase of German coal by the South Metropolitan Gas Company; and the Gaslight and Coke Company were also coupled-up as purchasers with the South London undertaking. The newspapers made the quantity of German coal contracted for swell from the 350,000 tons of the previous week to a million tons; and all sorts of calculations on totally supposititious and incomprehensive bases were made to show that the Companies were, taking the lower ruling freightage into account, going to save about 3s. per ton on the coal contracted for, as compared with the last contracts for British coal. Those who know the real facts—those who sit within the Board-rooms of the two Companies named, and their chief executive officers—must be smiling hugely over this assumed cognizance by the newspapers of their doings, and over the hypothetical character of the main information and its embroidery. There is no official confirmation of the statements; there is no contradiction of them. Some coal-owners say there is authority for a partial acceptance of the assertions; others altogether discredit them. For our own part, we shall be surprised if at any time we hear that any contracts which may have been made for German coal up to the present time stand, in the matter of quantity, anywhere other than in the lower region of the speculation that has been so freely circulated. Mr. H. E. Jones—who, with his intimate connections with London gas enterprise, knows a great deal of what is transpiring beneath the surface—at the Wandsworth Gas Company's meeting last Tuesday, said that he did not credit the tales that were afloat, and that, if any London Company had contracted for German coal, he did not believe that the quantity would be equal to more than one-tenth or even one-hundredth part of their requirements. The while Mr. Frank Jones, who is one of the Directors of the South Metropolitan Gas Company, sat near his father with inscrutable face. On the other hand, the gas industry knows well Mr. Charles Carpenter, D.Sc., the Chairman of the South Metropolitan Gas Company. They know that first reticence, and then the springing of surprises, are not altogether foreign characteristics; and they are also in possession of his views regarding the undue grasping of the coal-owners in the months of two years of abnormal opportunity. One considerable coal buyer the other day, contrary to Mr. Jones, assured us that he firmly believed the purchase of a million tons of German coal would be found to be true; and that he himself had quite recently been brought into contact with German coal agents. Altogether the real position of the matter is as obscure as it is entertaining; and the actual truth is not likely to leak out until the London Companies have covered their coal contracts for next year.

The reports as to German coal purchases have, of course, something to account for their origin. Their issue, too, appears to have been a common one, judging from the simultaneous publication of the news in several papers. But there are two things that are overlooked by the newspaper commentators. The first is that neither the South Metropolitan nor any other gas company would be likely, under the present pressure of the financial results of their trading, to contract for large quantities of German coal till they were in possession of the views of the coal proprietors as to rock-bottom contract prices for British coal for the coming year. They would not enter into contracts for German coal, unless very tempting offers were made, merely to spite British coal-owners for the adverse balances they have been instrumental in creating for the gas industry in the past six months, and are similarly doing in the current six months. The second point is that a saving of 3s. per ton on the delivered German coal compared with the last British coal contracts would probably not pay, with a reduction pending at home, in view of the somewhat lower productive value of the German coals, unless a very special coal of which we are not aware has been secured. On the other hand, several gas-works have had reason to complain bitterly during the last year or two of the lower quality of some of the Northern coal that they have been receiving under their contracts, and which has not only yielded less, but has reduced their carbonizing capacity in relation to output until matters have been adjusted. However, the reported 3s. per ton saving must be looked at from the point of view of the manufacturing value of the material bought; and this is a matter that has been overlooked by the newspapers.

Within the pale of the coal industry, an attempt is being made to set in circulation the words "German bogey," and to regard the published statements as to German coal purchases as something diplomatically set afloat just prior to the contract season for gas coals, for the purposes of agitating the coal-owners, and of forcing-down prices they would prefer to maintain. The "Iron and Coal Trades Review," for example, says it is "a coincidence that the statement has "been circulated at a time when it is expected that inquiries "will shortly be made for supplies from British collieries." We fail to see anything curious about this. The gas companies are quite at liberty to begin their contracting whenever favourable opportunity offers; and they are equally at liberty to purchase from any quarter they please, just as the railway companies are to purchase engines and coals from abroad if they can get what they require on more favourable terms. The "Review" also speaks of the periodical production of the German "bogey" by the gas companies in an effort to "bear" the home market. The same paper has a sneer at gas companies for (so it assumes) adopting the rôle of "philanthropic institutions." If the "Review" had used the words parliamentarily controlled "public "institutions"—public institutions which, contrary to the coal proprietors, cannot pay those who finance them a higher dividend without reducing the price of their staple commodity—it would have been nearer the mark.

Our contemporary also fancies the gas industry regards it as little short of "absolute wickedness" for the coal proprietors to charge it the "full market value." This is precisely a point the gas industry does not make; inasmuch as the term "full" in its relation to coal prices at present signifies "bloated," and "market value" something that is manufactured from abnormal ingredients, *plus* anything the coal proprietors choose to come to an understanding upon. The "Review" does itself an injustice if it thinks that the commercial men of other industries are willing to accept any such clumsy attempts as it makes at hiding the true position by talking in this connection of "market value." The term forms a poor screen to-day in connection with coal. The wickedness of the gas industry, in the eyes of the "Review," really consists in its endeavour to protect itself, and to avert, if possible, the same financial shortages that have occurred, and will inevitably occur again, this half year. The paper that scoffs is the same paper that defends the coal proprietors in their policy of extracting the last penny possible from the British public, through the extraordinary combination of a long coal strike, a clearance of stocks, the fortifying by considerable coal consumers of their interests by the provision of bigger stocks than hitherto, and a largely increasing transfer of British coals to other countries. The gas industry, tied by statutory regulations and stipulations, and subject to the keenest competition, ought not to do anything in the protection of its own interests that is repugnant to the coal-owners; but the coal-owners ought to be permitted to do anything they like that is hostile to the public interests, including those of the gas industry. This is the argument put forward from their own side. It is pitiably weak.

Reverting to the matter of contracts. Prices are on the decline. Mr. Carpenter stated, at the South Metropolitan Gas Company's meeting, that certain Continental cities have

contracted forward at 2s. 6d. per ton reduction; and Mr. Jones told the proprietors of the Wandsworth Company last Tuesday that he had just left a meeting of Directors, at which a considerable quantity of coal had been purchased at a reduction of 1s. 9d. per ton, but he was looking forward hopefully to a 2s. 6d. reduction. Another company in which we are interested have had, from more quarters than one, an offer at 2s. per ton less than last contract prices, and have decided not to settle anything yet. We are not going to take the responsibility for suggesting delay in making contracts. But we may express for what it is worth the view that the indications are that too much hurry is unnecessary, and that gas undertakings need not all flock into the market at once. There is another point. Old contractors are sometimes very good friends; but, at times like the present, it is not particularly good policy to enter into contracts without placing inquiries for prices far and wide, so as to encourage the largest possible competition. This is a piece of advice that we strongly urge, and not without reason.

Carbonization in Bulk.

In the "Engineering Supplement" of "The Times" last Wednesday, there was a short article on "Coke-Oven Gas "for Lighting," in the opening lines of which, after referring to the excitement to which the advent of public electricity supply some thirty to forty years ago gave rise in the gas industry, appears the following statement: "Recently "the future welfare of gas concerns has been causing re-"newed anxiety in certain quarters, and a different, and to "some extent plausible, explanation is offered for the mis-"givings. The arguments now put forward relate to the "rapid strides made by the coke-oven industry in recent "years, and to the possibility of this type of gas entirely "superseding coal gas on the grounds of economy." We are quite certain that the writer of the article in question does not share in the suggested anxiety, of which we have seen no symptoms whatever in any quarter capable of forming judgment, and able to draw logical conclusions from the position and the signs that there are about us as to the likely course of the evolution of the two industries. It is regrettable that a statement of the kind should obtain publicity in a paper such as "The Times," without the fact being made abundantly clear that, if any such anxiety exists, the foundation for it is absolutely without substance. Under the conditions prevailing in this country, the indications of coke-oven gas "entirely superseding coal gas on the grounds "of economy" are undiscoverable by intelligent observers. The coke-oven owners themselves do not encourage any idea of the kind; the builders of coke or chamber ovens do not entertain any notion of the eclipse of the town-gas industry by the industry with which they first commenced operations. Certainly the men of the gas industry, or the majority of them, have no place for the belief that the gas produced by the coke-oven industry is ever likely to entirely supersede gas made in gas-works. Supposing, however, it did, the present purveyors would, under a permanent statutory authority, be the purveyors still. So why "anxiety"? The technical men of the gas industry are persuaded—Mr. H. E. Jones's views upon the subject, as expressed at the Wandsworth Gas Company's meeting last Tuesday, represent a large mass of opinion in gas professional circles—that a more economical and serviceable use of coal can be made by gas-works than by the coke-ovens at the pit-heads. The competitive activity, too, of the owners of coke-oven and chamber systems for the carbonization of coal in bulk primarily for town-gas production is an indication of the inclination of their opinion. Our view is (particularly where there is a demand for dense coke for manufacturing purposes) that a carbonizing process will be adopted by gas-works to comply with this demand, so as to relieve to an equivalent extent the other coke markets.

On the Continent, there has been within limits a considerable utilization of coke-oven gas for town-supply purposes, which is quite a different thing from any suggestion as to "the possibility of this type of gas entirely superseding "coal gas on the grounds of economy." On the Continent, too, is found a large adoption of chamber ovens for bulk carbonization for gas-production purposes. These two facts are somewhat significant ones for the digestion of anyone who has any uneasiness as to some miraculous revolution lying ahead. The real position is that there will be, if we are not mistaken, a greater blending in business of the two great carbonizing industries, wherever possible, to their mutual advantage, to the benefit of the community, and to the discomfiture of the competitors of the gas industry. A number of small communities in this country are using coke-oven gas for domestic purposes; Middlesbrough has made a bargain for coke-oven gas; and the Thornaby-on-Tees Corporation are in Parliament this year asking for gas-supply powers with, in contemplation, the use of coke-oven gas from a neighbouring plant. Birmingham has its chamber-oven plant, Darwen has a plant under way, and the small gas-works at Ferndale (Glam.) also uses chamber ovens. The gas and the coke-oven industries are working together in the development of the sulphate of ammonia market; and in connection with other residuals, there may hereafter be mutual effort. We cannot for the life of us see where there has been occasion for "renewed anxiety," nor have we seen any of it. Perhaps, in one quarter, imagination has had a little play.

The subject of bulk carbonization for town-gas production was brought, in the form of a paper, before the London and Southern Junior Association last Friday by Mr. G. Stanley Cooper, of the Koppers Coke Oven and Bye-Products Company. Mr. Cooper did not profess that he had anything new to advance. But a paper of the kind that he then presented always brings its subject to the close attention of those present at its reading; and when the author is a man who has made special study of his theme, this enables those present to ply him with questions (the Southern Juniors displayed good zeal in this regard) for the extraction of further information. The paper is largely a description of the Koppers chamber ovens for town-gas production, the progenitors of which were the coke-ovens on, in principle, the same system. Mr. W. Chaney's paper before the last meeting of the Institution of Gas Engineers supplied the gas profession with practically all that there was at the present time to be known regarding the working of the system as adapted for British gas-works purposes. But Mr. Cooper, of course, is technically interested in the system, and likewise in its commercial well-being; and here and there we detect the commercial interest creeping out in drawing comparisons between large bulk carbonization and other systems. For instance, the author says it has long been recognized that there is an "enormous loss of gas" in a retort-house every time a retort is charged. It would be a difficulty for Mr. Cooper to prove this assertion were he to compare the makes per ton of coal carbonized in many gas-works from horizontal and vertical retorts with the makes from chamber ovens. The more expeditious modes in the retort-house of to-day, and the heavier and longer duration charges, have considerably altered the condition of gas waste to which he refers; and with continuous vertical retort working, his criticism cannot possibly apply.

Another point in the paper that comes in much the same category is to the effect that coke-oven gas as it is usually made often contains as much as 10 per cent. of nitrogen; and consequently its illuminating and calorific power are both lower than is desirable in gas for town purposes. This criticism might have held good a few years ago; but to recent coke-oven installations it does not by any means generally apply. We have several analyses of coke-oven gas in which the total inert gas is under 10 per cent., which does not contrast badly with the town gas in numerous places, and it has quite a comparable calorific power. Mr. Christopher is responsible for an average figure from four distinct coke-oven plants of 7·3 per cent. of nitrogen, and 2 per cent. of carbon dioxide. Mr. Cooper in his present paper gives 3·48 per cent. of nitrogen, and 2·6 per cent. of carbon dioxide—these being figures obtained during a ten-day test at Vienna. The first-named figure is a remarkably low one. Mr. Chaney, in his paper, gave an analysis of the Koppers oven gas at Birmingham, which showed 6·5 per cent. of nitrogen and 2·1 of carbon dioxide. So, altogether, in respect of modern carbonizing methods in gas-works, in coke-oven plants, and large chamber plants, there is really not much difference in the nitrogen content of the gas. Bulk carbonization in chamber-ovens has its own special advantages, which will, without decrying other systems, stand well alone—particularly as to low labour charges, the character of the coke and tar produced, and the quantity of ammonia. The constructional features of the Koppers ovens are particularly interesting; and those who have not studied the method of heating the chambers before can do so now in brief. The heating is one of the distinctive features of this type of chamber; the remarkably uniform heating obtained being one of the secrets of the

excellent results of the carbonization of the charges. Mr. Cooper is also in favour of the outside producer—either the Mond as used at Birmingham (with ammonia recovery), or the Kerpely as employed on the Continent.

The reference made by the author to the Koppers direct ammonia recovery process is also interesting, as it will be a real development, if successful, in gas-works practice. In this country for some time past, certain of the smaller gas-works have used the direct system; but the larger works have been shy of it on account of the assumed deterioration of the illuminating power of the gas. The experience, however, in coke-oven works, that the bringing of the gas into direct contact with sulphuric acid does not affect either the calorific power or the composition, encourages an extended application. For the Simon-Carvès direct-recovery process, it is claimed that the candle power of the gas is actually improved owing to the early separation of the tars. At the Buda-Pesth gas-works, some 9½ million cubic feet of gas are now subjected to the Koppers direct process, which involves the preheating of the gas. The system was described in the "JOURNAL" for Oct. 7 last; but it had not then (if we are correctly informed) started work. We shall, however, be pleased to receive, as early as possible, an account for publication giving working details, as, if the high hopes entertained of the system are verified in practice, we shall have the requisite confirmation of Mr. Cooper's confidence that the system "is sure to come into more general "use in the near future."

Distribution Work at Bradford.

THE President of a Junior Association need not go beyond his daily practical work, if pressure of duties stands in the way of making some special investigation for a subject, in order to obtain suitable material for an address. Mr. Chas. Roper, of Bradford, proved the point by the address he delivered last Saturday to the Yorkshire Junior Association, in which he described features and methods relating to the distribution system of the Corporation Gas Department. We have read the address with much interest. It is of a composite character; and two or three points invite a few comments.

The question of piping streets by a duplicate footpath system for local supply—that is, laying a pipe under each footpath—is one that has come largely to the front during recent years, owing to the extensive and almost universal adoption of electric tramway systems, and the new order of strong foundationed roads that modern traffic necessitates. The greatest objection to the laying of mains under each footpath is, Mr. Roper points out, the initial cost; but under modern conditions in roads with concrete beddings for tramways or paved surfaces, initial expense is a matter of comparatively small importance compared with ultimate expense. What is found in connection with the manufacturing plant is equally true in connection with the distribution system. Economy during the life of any subject on works or in the district is worth a purchase price in first cost. Mr. Roper speaks of the cost of the reinstatement of the road when a pipe has to be opened up for any purpose in a road in which (say) tramways are laid. It is not only a question of the cost of reinstatement; it is a question as well of the cost of opening up. A celebrated engineer told us one day that it made his "heart bleed" to see mile after mile of good 9-inch concrete broken through in a certain district in connection with main-laying operations; and the cost of the opening up—well, he remarked, "the less said on that point the better." The awkwardness of carrying on work in thoroughfares crowded with traffic, and especially under tramways, is very apparent; and, in all such places, expense is increased when work has to be executed. Of course, all thoroughfares will not permit the footpath system of treatment; for gas-mains are not the only things requiring subterranean accommodation, and some footpaths in many provincial towns are very narrow. The advantages of the system, however, are obvious—less costly accessibility, shorter service-pipes, less public inconvenience, less vibration, and consequently reduced leakage. Of course, duplicate pipes of the kind mean smaller diameters; and with variable draught on the mains, and the additional friction in proportion to the volume of gas transmitted through the pipes compared with one of larger diameter, may make variations in pressure rather more pronounced with the system. But such variations may be minimized by transverse connecting-pipes. Altogether, under the conditions described, there is much to be said in favour of the footpath system of local distribution.

The distribution system at Bradford seems to be a fairly difficult one with which to deal, not only owing to the crowded character of the streets, but due to sharp and frequent variations of level; the complexity being enhanced by the large differences in the demands of consumers along the route of the pipes. It is noticed that Bradford, like some other northern towns, still adheres to wet meters, with their attendant worry and demand for attention—meters, too, which require extra long filling-tubes, in order to stand the pressures. In the presidential address of Mr. Charles Wood to the Institution of Gas Engineers in 1906, he referred to the trouble that he had experienced in Bradford through electrolysis and fusings. It now appears from Mr. Roper's address that the Corporation Gas and Electricity Departments have come to a mutual agreement not to allow their pipes and cables under the footpaths to have closer proximity than 12 inches, without a flagstone provides a partition between. Twelve inches cannot afford the gas-pipes much protection from stray current, particularly when the soil is moist; and the 12 inches cannot supply much "elbow-"room" when work is required on either the pipes or the cables. However, this is the minimum; but in practice as wide a berth as possible to electric cables is clearly the rule to be followed.

The question of the keeping of records of the distribution system takes a prominent place in the address. All well-ordered works maintain up-to-date plans of the distribution system. But all gas-works are not well-ordered; and we have come across some in our travels where definite records of the kind have never been kept. The system of having both book records and plans maintained close to actual existing conditions from these records is a very good one; and so is the keeping of photographic records of the plans in another place for safety in case of fire. As Mr. Roper says, there is no excuse for the slackness that is sometimes found in connection with the possession of precise knowledge regarding the distribution system; and working economy as well as public convenience place as an obligation on every gas undertaking, large or small, the keeping of such records. In the matter of local economy, it is also a good plan for each department using the subsoil to receive from the others information as to all road openings, so that there may be an opportunity of carrying out work simultaneously, if there is any to be done by one or more of the other departments. Another exemplary practice is the placing of an outside valve on all services of 1½ inches diameter and upwards. It is certain that, with the enormous maximum daily output of gas in Bradford, Mr. Wood will soon have to be considering the question of making his gas-storage accommodation exceed the present 10 million cubic feet, which is spread, the address informs us, among no less than a score of holders.

Is a Central Lighting Board Practicable?

THE summary published last week of the paper read by Mr. Leon Gaster before the London Society, on the public lighting of London, invites a few comments in respect of one or two matters. It is a big subject to tackle, and a complex one, owing to the conditions that exist in London, with so many local authorities controlling the public lighting, with some of them administering electricity undertakings, with the majority of those so administering electricity concerns manifestly oblivious of the fact, when considering public-lighting contracts, that gas companies are enormous ratepayers, and with the diversity of views and personal influences that prevail among members of local authorities. Under present circumstances, we entertain no hope of normal street-lighting practice obtaining throughout the length and breadth of London. Mr. Gaster would like to see greater order reign. We should all like to see it, providing it could be brought about by a just consideration of all claims. His remedy for the present chaos in the matter is a Central Lighting Board for the Metropolis. But until there was information as to how such a central authority would be constituted, we should be very suspicious of rigorous fairness being done to the competing illuminants from all points of view. What would be the composition of such a central authority? The members would be largely drawn from the borough councils; and, on a public body of the kind, it is not at all likely that there would be representation of the gas and electricity companies. The result, in our opinion, would be that the representatives from borough councils possessing electricity concerns would be able to bring their influence to bear in a manner that would not contribute to fair adjudication, and merit would

not always be successful. The illuminant that has the best penetrating power in bad weather, the illuminant that has the best distribution value, the illuminant that for a given candle power has a much lower intrinsic brilliancy than its competitor, the illuminant that for lighting in streets in which high-speed traffic now prevails is not to be surpassed for reliability, does not always get its deserts at the hands of a borough council possessing an electricity supply station. Would all these merits be considered under a central authority? Would it be possible to constitute a central authority for this purpose that would be above suspicion of being led by anything but merit consistent with purpose and economy? We have our doubts.

It may be that prejudice has got a hold over us, owing to what is within knowledge as to the effects of the multiplex representation of members of corporation electricity committees. There are cases known where such members are on street and lighting committees, on the education committees, on the public buildings committees, and on the boards of guardians; while no representative of the local gas company is on these various bodies; and, if one were, what chance would he have without the power of voting on a lighting contract, and with the bulk of the members—being members of the corporation—quite ready to act like so many electrically operated automata. At heavy expense, the lighting of streets is handed over to the electricity department, schools that are little used during hours of darkness have money spent upon them for electric lighting (and, to reduce the expenditure, all the tenets of the scientific illuminating engineer are mercilessly disregarded), and workhouses and infirmaries are handed over to the electricity department. Competition is not allowed, and, often when it is, the electricity department is permitted to amend its tender to get below the handicapped gas company. There has been more violation of the principles of local government than ever existed before since electricity supply has obtained the dominating influence of a department under the local governing body, and with the gas supply directed by private enterprise. Electricity trading has, indeed, become a big controlling factor in local government; and, wherever it touches, there is little independent judicial action in settling questions relating to the public service. We are sorry that there should be occasion to show so little faith in local bodies who are influenced in such a way that it cannot be said that both illuminants have fair field and no favour in the trading competition. Where both services are under municipal direction, there is, as a rule, greater fairness; and the same can usually be said where the two services are in the hands of private enterprise, with competition on equal terms. Mr. Gaster makes another suggestion (this was in the reply to the discussion) that, in the absence of a central public lighting authority "illuminating experts who had no axes to "grind with regard to one illuminant or another would be "a great help to the borough councils." Will Mr. Gaster supply us with a list of illuminating engineers who have no predilection for one illuminant or the other, and who are not interested in the sale (say) of lamp fittings?

The paper shows very clearly the great progress that has been made in public lighting; and how the ratepayers are now enjoying much more illumination for less money than before, and so are reaping advantage. But we wish the local authorities would not draw all the savings into the municipal cash-box, and then pat themselves and no one else on the back for the improvement that has taken place in the street lighting. As Mr. Frank Bailey pointed out in the discussion, in these days of high-speed traffic in the streets, extra good lighting is required. But there ought not to be sharp contrasts in the lighting power of the sources of illumination; lamp-posts and lanterns ought not to be archaic and a disgrace, but should be a credit to the streets; and money might be expended in enlivening places at night time by using artificial light to bring into view the beauties of architectural feature, statuary, and so forth. There is plenty of room for the expenditure of extra money upon the lighting of our streets and public places. There is also room for the determination of contracts not only upon the monetary consideration, but upon the merits of illuminants as already described. We are glad to find Colonel R. E. Crompton, the author, and several others protesting against the use of lamps of excessive intrinsic brilliancy in the streets without properly shielding them, so that the eyes of pedestrians and drivers are not affected by them. The paper (which was a long one) was full of points; but the abstract given last week supplies what, in our opinion, were the salient parts. It contained credit for what has been done; criticism on points that do not reach the ideal; and a gentle slap here and there at antiquity that has no legitimate place in the scheme of modernity.

London Gas Companies' Working Last Year.

In another part of the "Journal" will be found a table giving the financial results of the working of the three London Gas Companies in the year ending on the 31st of December last, with the items of revenue and expenditure worked out at per 1000 cubic feet of gas sold. For the sake of comparison, similar particulars for the two preceding years are given. The table will supplement the fuller analyses of the past year's working prepared by Mr. F. J. Bradfield, the Secretary of the Commercial Gas Company, which, by his courtesy, we were able to give last week and in the number for Aug. 12, 1913. It will be seen that the capital (including premiums) engaged in the supply of gas on Dec. 31 amounted to £40,528,419 16s. 11d., that the total income was £7,990,357 19s. 2d., the expenditure £6,320,297 13s. 2d., and the gross profit £1,670,060. The last-named amount was £4 2s. 5d. per cent. on the capital and borrowed money, and £32 11s. on the total gas-rental. On the basis of each 1000 cubic feet of gas sold, the figures are: Capital, 18s. 5·46d.; income, 3s. 7·66d; expenditure, 2s. 10·53d.; profit, 9·13d. Those for the year 1912 were: Capital, 18s. 7·78d.; income, 3s. 6·6d.; expenditure, 2s. 8·98d.; and profit, 9·62d.

The following table shows the carbonizing results of the three Companies, so far as they relate to the manufacture of gas from solid raw material only; and it will be noticed that the mean make per ton last year was 12,420 cubic feet, as compared with 12,373 and 12,047 cubic feet in the two preceding years.

Table *showing the Residual Products and the Gas Made per Ton of Coal by the Metropolitan Gas Companies in the Year* 1913.

Name of Company.	Coke.	Breeze.	Tar.	Am. Liq.	Gas.
	Cwt.	Bushels.	Gallons.	Gallons.	Cub. Ft.
Gaslight and Coke .	12·54	5·77	9·96	33·09	12,261
South Metropolitan .	12·35	4·30	9·64	40·85	12,522
Commercial	12·50	4·56	12·58	39·62	13,472
Mean per Ton . .	12·47	5·20	10·00	36·11	12,420

Coke for Domestic Purposes and Steam-Raising.

Coke supplied one of the features of the excellent address delivered by Mr. Charles Hussey at the meeting of the Croydon Gas Company last Friday. The Company are strong supporters of all organized effort in the industry; and they are among the concerns that are zealously backing the work of the London and District Coke Committee. At the same time, they are supplementing by local activity the work of the Committee, in view of the necessity for finding a larger market for the growing quantity of coke that there is now for disposal, owing to the increasing business of gas undertakings, the slackening of use by the cement makers, and other causes. The endeavours that are being made are bearing good fruit. In January, nearly 1000 tons of coke were delivered to local consumers, which quantity is about half as much again as was sold locally in the opening month of 1913. This is good business. A motor lorry is now engaged in effecting deliveries in the Company's outlying districts. It will be seen in our "Correspondence" columns that Mr. A. Hugh Seabrook, the Chief Engineer of the Marylebone Borough Council Electricity Department, has been attracted by recent references in our columns to the subject of the use of coke for steam-raising; and he asks for further information in regard to it. In a footnote to his letter, an attempt is made to satisfy him. If any of our readers can usefully supplement what is there stated, we shall be pleased to hear from them. There ought to be a good deal of scattered information in the industry bearing generally on the matter, which at the present time it would be well to bring together.

Lights and Colours.

The question of converting artificial light to the equivalent of daylight, so that it can be confidently used in matching colours, came up again in connection with a discussion on Tuesday evening last, at the meeting of the Illuminating Engineering

Society, on the subject of the lighting of art galleries and studios. The discussion was opened by Professor Silvanus P. Thompson, D.Sc., F.R.S., the distinguished President, who is shortly to be succeeded by Sir William Bennett, from whom a pronouncement of views has already been received on the subject of high intrinsic brilliancy lights, their use, and ill-effects. What Sir William says on this subject must have good results in influential quarters. About the lighting of picture galleries, there are two things that are very important—one is to get lighting from the proper direction, so that pictures may be examined without a great deal of blurring reflection; and the other is to obtain artificial light that will, when the pictures are examined after daylight fails, give a presentment of their natural tones. We do not seem to have gone very far along the road toward simple practicable expedients for neutralizing excesses in the spectrum composition of artificial lights to give us what is required, though Dr. H. E. Ives, Mr. T. Thorne Baker, and others have produced excellent filtering screens. Yet the light obtained through the screens that we have seen seems to have something unnatural and ghastly about it. In his observations at the meeting, Professor Thompson said he does not like, in connection with the colour question, the greenish tint of the light from some gas mantles. But in saying this he does not rule-out all gas mantles, for he finds there are differences in them. As he did not mention the latest results of the work of Dr. Ives and Mr. Thorne Baker, in which they have found the incandescent mantle has a closer approach to the spectrum composition of daylight than any electric light, and therefore is easier to work upon in neutralizing any excess components, we fancy it must have escaped his attention; nor did he say anything about high-pressure gas-lamps, although reference was made by him to arc lamps. Probably he has not had an opportunity of thoroughly considering the claims of such lamps.

Spurious Artificial Daylight.

However, after all the work of authorities on this subject of obtaining means for bringing artificial lights into approximate harmony with daylight, the electric lamp makers come along, and suggest that, by simply enveloping a metallic filament lamp in a tinted blue glass, they obtain all that is required. Professor Thompson claims for these blue-enveloped lamps a distinct success, yet he agrees that there is still much to be done, owing to the complexity of the colour question. Between these two expressions of opinion, the makers of blue-globed lamps will not find very much consolation or encouragement, as it is conclusive that the blue globe has not carried them to the final goal. As a matter of fact, such lamps are altogether spurious claimants to being producers of artificial daylight. If they were real producers of artificial daylight, they would not play such pranks with the colours of pictures as they do. At the meeting, one of the lamps was shown alternately in comparison with a metallic filament lamp in a plain globe in illuminating painted pictures; and if the makers of the blue-globed lamps had heard some of the *sotto voce* expressions of the artists present, they would not have stood up and owned to their parentage. Some of the colours of the picture were much intensified by the lamps, some of the features were brought into more striking relief, others were detrimentally affected; another picture was an ill-looking daub with the blue light upon it. The artists are not prepared to admit that the mere cloaking of metallic filaments in blue in this fashion is giving them the equivalent of daylight.

Other Views on Blue.

We see in a notice as to the conversion of the arc lamps at Harrod's Stores to half-watt ones (in glass spheres to annihilate the excessive intrinsic brilliancy), it is claimed that "the colour of the light, as compared with the colour of light from the old arcs, is vastly improved, having whiteness without the excess of blue given by the arcs." Now Mr. Trotter tells us daylight is distinctly blue, especially when the sky is blue; and therefore it cannot be the purest whiteness that is required for colour matching. However, what is wanted is certainly not a lamp that will intensify colours, and make others look horrible. If an envelope of blue-tinted glass is all that is needed to make electric metallic filament lamps the equivalent of daylight (we do not believe the problem is capable of any such simple solution), then it ought to be a very easy matter to effect conversion by finding a suitable globe for incandescent gas mantles, in view of the composition of the light from them. Of course, such globes cause a large drop in the illuminating efficiency of any source of light; but when a special quality of light is required for a special purpose, one has to provide and pay accordingly.

INSTITUTION OF GAS ENGINEERS.

Meeting of the Council.

A Meeting of the Council of the Institution of Gas Engineers was held at No. 39, Victoria Street. Westminster, last Thursday—the PRESIDENT, Mr. Edward Allen, M.Inst.C.E., in the chair. Various matters were discussed and referred to Committees of the Council for further consideration.

It was reported that Mr. Thomas Goulden had been elected a member of Council, to succeed to the vacancy caused by the election of Mr. John Young, of Hull, as Junior Vice-President; and that Mr. T. E. Franklin, of Barry, had been elected to represent the Wales and Monmouthshire District Institution of Gas Engineers and Managers, as district member of Council for 1914-15. Lists of those members who had been removed by death and of others who had resigned were laid before the meeting. The names of a number of candidates for membership for inserting in the next ballot list were approved; and several tranferences from the class of associate member to member were made.

A proposal from the Illuminating Engineering Society that the President of the Institution become a Vice-President and member of Council of the Society during his year of office, was favourably received.

Preliminary arrangements for the meeting of the Institution at Liverpool, commencing on Tuesday, June 16, were made.

With reference to the examinations in "Gas-Fitting," reports were received from various District Associations as to the appointment of Local Examination Committees; and it was proposed to hold a conference of these Committees in due course. Messrs. H. Kendrick, of Stretford, and Ralph Halkett, of Glasgow, were nominated for the positions of Chief Examiners.

A letter was received from Sir Philip Magnus, M.P., Superintendent of Technological Examinations, pointing out that Mr. Thomas Glover's period of office as Examiner in "Gas Engineering" would expire after the next examinations. The Council expressed their cordial appreciation of Mr. Glover's services. Mr. Samuel Glover, of St. Helens, was nominated for appointment to this examinership.

An invitation from the Institution of Mechanical Engineers to a conference on the subject of "Engineering Research" was accepted. The President and the Hon. Secretary were appointed to represent the Institution.

A statement of accounts with reference to the Kelvin Memorial Fund was received, showing a surplus of £460; and a proposition was made by the Committee of the fund that such surplus should be devoted to the inauguration of a Kelvin Gold Medal, to be awarded triennially as a mark of distinction achieved in engineering work. The Council agreed to this proposal.

Reports of the Emergency and Finance Committees, with the annual accounts, were presented and adopted.

An invitation from the Panama Pacific International Exposition for the Institution to hold a meeting at San Francisco during the exposition in 1915 was received; and while it was not thought to be possible to arrange for such a meeting, it was hoped that delegates to represent the Institution might be found to attend the International Engineering Congress which is to be held in connection with the exposition.

Obituary.

The death took place at Pocklington of Mr. RALPH SPIVEY, the Manager of the local gas-works. Mr. Spivey was 48 years of age, and held his position for nearly twenty years. For some time past he had been in poor health.

Personal.

The Directors of the City of Durham Gas Company have appointed Mr. ROBERT W. NICHOLLS to succeed as Works Manager Mr. Tobey, who, as already recorded, is taking up the position of Manager of the Townsville (Queensland) Gas-Works. Mr. Nicholls is at present at Darlington, under Mr. F. P. Tarratt.

It is announced that Mr. GEORGE BRAMBLES, the Managing-Director of the Bridlington Gas Company, has resigned his position, now that he has attained his 85th birthday; and he is to be succeeded by Mr. JOHN KELLY, the Secretary and Engineer to the Company. Mr. Brambles will not, it is understood, relinquish his seat on the Board, nor will Mr. Kelly, when taking up the duties of Manager, give up his post of Secretary and Engineer.

THE METROPOLITAN GAS COMPANIES' ACCOUNTS.

For the Years 1911, 1912, and 1913.

—	Year ended Dec. 31, 1911.		Year ended Dec. 31, 1912.		Year ended Dec. 31, 1913.	
	Totals.	Per 1000 C. Ft. of Gas Sold.	Totals.	Per 1000 C. Ft. of Gas Sold.	Totals.	Per 1000 C. Ft. of Gas Sold.
	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	s. d.
Capital and borrowed money (including premium capital)	40,142,763 2 0	19 4·80	40,560,260 10 6	18 7·78	40,528,419 16 11	18 5·46
Income—viz.:						
Gas rental	4,932,271 4 4	2 4·61	5,082,241 15 9	2 4·04	5,131,567 17 1	2 4·04
Rental of meters	252,328 14 9	1·47	229,209 8 4	1·26	234,661 0 4	1·28
Rental of stoves, fittings, &c.	411,171 3 9	2·39	505,185 11 0	2 79	545,093 6 5	2·98
Residual products—						
Coke and breeze	1,083,266 10 10	6·28	1,183,118 6 0	6·53	1,312,622 1 4	7·17
Tar and tar products	226,588 12 7	1·31	263,265 9 11	1·45	317,894 16 0	1·74
Amm. liquor and sulphate of ammonia	378,110 15 11	2 19	421,683 14 5	2·33	412,020 12 1	2·25
Miscellaneous, including old materials	36,858 11 1	0·21	36,365 0 11	0·20	36,498 5 11	0·20
Total income from all sources	7,320,595 13 3	3 6·46	7,721,069 6 4	3 6·60	7,990,357 19 2	3 7·66
Expenditure—viz.:						
Coal and oil, including carriage and dues; also coke and breeze used for making carburetted water gas	2,135,282 8 3	1 0·39	2,451,164 17 9	1 1·52	2,868,497 19 5	1 3·67
Salaries of engineers and officers at works	68,835 16 0	0·40	71,102 1 3	0·39	73,059 5 10	0·40
Wages—manufacture	316,185 17 1	1·83	343,309 11 10	1·89	334,848 11 6	1·83
Purification	83,225 18 8	0·48	88,717 11 6	0·49	83,469 10 3	0·46
Wear and tear—manufacture	778,328 15 2	4·51	829,134 5 6	4·57	799,257 19 0	4·37
Salaries and wages—distribution	161,733 14 2	0·94	173,169 17 1	0·96	175,503 14 4	0·96
Repair and maintenance of mains and services	261,867 3 11	1·52	314,555 7 2	1·74	301,286 11 10	1·65
Repair and renewal of meters, stoves, &c.	642,391 17 6	3·73	708,170 13 9	3·91	697,418 5 9	3·81
Lighting and repairing public lamps	67,609 1 5	0·39	65,889 17 10	0·36	63,300 0 2	0·35
Rents, rates, and taxes	471,324 12 6	2·73	479,929 6 1	2·65	482,606 8 1	2·64
Salaries—management	30,581 12 0	0·18	30,014 3 8	0·17	29,592 0 1	0·16
Collectors' salaries and commission	92,650 15 9	0·54	96,496 15 11	0·53	96,618 3 2	0·53
Stationery, printing, and general charges	58,939 19 1	0·34	62,982 12 7	0 35	59,532 6 7	0·32
Directors and auditors	16,547 19 5	0·10	16,682 0 0	0 09	16,597 0 9	0·09
Co-partnership and profit-sharing schemes	84,473 0 3	0·49	97,507 15 11	0·54	105,948 0 4	0·58
Annuities to officers and workmen	75,421 18 10	0·44	110,360 13 4	0·61	86,790 18 9	0·47
Contributions under National Insurance Act	..	..	7,171 8 3	0·04	15,010 18 11	0·08
Law and parliamentary charges	7,731 1 9	0·04	6,975 3 3	0·04	8,153 3 11	0·04
Bad debts and extraordinary expenses	29,551 14 0	0·17	23 882 19 1	0·13	22,806 14 6	0·12
Total expenditure on revenue account	5,382,683 5 9	2 7·22	5,977,217 1 9	2 8·98	6,320,297 13 2	2 10·53
Gross profit	1,937,912 7 6	11·24	1,743,852 4 7	9·62	1,670,060 6 0	9·13
Do. per cent. on capital and borrowed money	4 16 6	..	4 6 0	..	4 2 5	..
Do. do. gas-rental	39 5 10	..	34 6 3	..	32 11 0	..

ELECTRICITY SUPPLY MEMORANDA.

THERE are a good many unbelievers in the world; there are some people who will not give credence to a thing though it stands before them with all the solidity of one of the Pyramids. There are people who will not do a simple arithmetical sum if they think it is going to subvert their erroneous beliefs. Of course, the electric industry does not want to think, however true it may be, that electric current is more proficient and more subtle as a fire-raiser than gas. As Mr. George Wilkinson, being the Electrical Engineer of Harrogate, is of the electricity supply industry, he does not want to think or to know that certain figures first published in the "JOURNAL" as to the relative work in fire-raising of electricity and gas in London have any foundation in fact. He could very easily have tested the matter for himself, without writing to the Superintendent of the London Fire Brigade to inquire whether the published calculations were correct, and without receiving the answer that the reports referred to were both incorrect and misleading. We are pleased to have to say that if that is a true rendering of the reply of the Superintendent of the London Fire Brigade, he does not understand the figures, and has not troubled to inquire into them. It seems (according to a report in the "Electrical Review") that there has been a keen controversy in progress at Harrogate between the advocates of gas and electricity in regard to the causation of fire. The paragraph proceeds: "The Gas Manager alleged that 'on a report of the London Fire Brigade it has been ascertained that fires caused by electricity average 1 to every 761 consumers, while those attributed to gas are only 1 to 2200 consumers.' The Superintendent of the London Fire Brigade was written to by the Electrical Engineer, Mr. G. Wilkinson, and stated that the reports referred to were incorrect and misleading." These figures are not the last published; and we can show a still better result. The last annual report of the London Fire Brigade (for 1912) points out that there were 170 fires which were known to have been electrically generated. Is this figure correct or otherwise, Mr. Wilkinson? The same report shows that there were 286 fires caused (mostly through negligence) by gas. Is this figure correct, or otherwise? In 1912, published statistics show, the London electricity undertakings had about 135,000 consumers connected to their cables. Is this figure correct, or otherwise? The three London gas companies in a smaller area had 1,220,397 consumers. Is this figure correct, or otherwise? Now if Mr. Wilkinson or the Superintendent of the London Fire Brigade is not in a position to deny these figures, by a simple division sum he will ascertain that the electrical fires averaged one per 795 consumers, and the gas-generated fires one to every 4267 consumers. Let it not be forgotten, too, that a great majority of the gas consumers have cooking-stoves and many of them gas-fires, as well as water-heaters; while the majority of the electricity consumers only employ the current for lighting. What has Mr. Wilkinson to say to this information? Additional particulars can be investigated by reference to the "JOURNAL" for Sept. 2 last (p. 601). But the foregoing will be sufficient for our Harrogate friend to be going on with.

What the Superintendent Said.

In all probability if the whole truth, and nothing but the truth, could be ascertained with regard to the fire-raising capability of electricity, we should have a startling statement to present to the public. The fires which take place in which the cause is stated to be "unknown" have been on the increase since electricity has been with us. More mansions have been burnt down, and other premises have been destroyed. More woodyards have caught fire; and often nowadays it is noticed in the reports of such fires that valuable electrical machinery has been destroyed. In the cases labelled "cause unknown," although electricity may be strongly suspected, the fire itself frequently wipes out all traces of its origin. In an article by the "Legal Contributor" to the "Electrical Review," he treats of the subject of "Electricity, and the Responsibility for Fires." He states that it is not easy to refute the allegations as to electricity having been the cause of a fire if the electrical installation is destroyed with the building. This is quite obvious; and it is equally true that it is difficult to say definitely, under such circumstances, without the testimony of eye witnesses as to the beginning of the conflagration, that a fire was caused by the electrical equipment. The writer considers the question whether, and how far, a company or local authority supplying electricity under the terms of a Provisional Order may be held liable for a fire upon a consumer's premises. Much, he says, appears to depend upon whether the electricity suppliers are responsible for the actual installation on the premises. If they are, their liability will be co-extensive with that of the independent wiring contractor—subject to this, that a local authority will be entitled to the benefit of the Public Autho-

Liability for Fires.

rities Protection Act, 1893, which provides that an action of this kind shall be brought within six months of the date of the alleged injury. Then it is pointed out that liability is by the Electric Lighting Acts extended expressly to negligence or nuisance in the supply of electricity; and this liability is strengthened by the Board of Trade Rule No. 36, which provides that: "The undertakers shall be responsible for all electric lines, fittings and apparatus belonging to them or under their control, which may be upon a consumer's premises, being maintained in a safe condition, and in all respects fit for supplying energy." Therefore, if they merely hire fittings, &c., to a consumer, they are liable. Rule 37 provides that: "In delivering the energy to consumers' terminals the undertakers shall exercise all due precautions, so as to avoid risk of causing fire on the premises." The writer, however, infers that the electricity suppliers must be proved guilty of negligence before they can be charged; this principle being established by various gas cases. It is quite clear that electricity suppliers may be held liable for damages caused by fire; but it seems equally plain that the existence of a fault must be proved. This is often a difficulty after the fire, which usually, with a fine consideration for electricity, wipes out all traces of its origin.

Truth in Advertisement.

While writing, the telephone bell rings, and consideration is directed to other forms of fires. One of the makers of gas-fires, having disposed of another matter, referred to the state of business, and wound up with the remark: "I think, considering the weather, we have all been happy this winter." The half-yearly reports of gas companies indicate that the makers have occasion to rejoice; for, without exception, there is the tale of a largely increasing gas-heating connection. On the other hand, our electrical friends regret the slow progress of the cooking and heating load for their particular commodity. As to the slowness, no one can be surprised; there is room for greater surprise over the fanciful notions of our electrical friends that human nature will take to electrical heating as a substitute for greater economy and efficiency. Sometimes, however, makers of electric goods in their advertisements are guilty of telling the truth. The people who make Belling electric "fires" say: "It is neither a fallacy nor a paradox that there is a bigger field for electric fires in spring than in midwinter." Undoubtedly, there is a "bigger field" in spring, seeing that no one with any consideration for comfort could tolerate a so-called electric "radiator" or "fire" in midwinter, though they might put up with one when the balmy days of spring are with us. We have also before us an invitation card to an electrical exhibition. There is upon it the picture of a lady sitting in front of an electric radiator; her feet are under the appliance; her knees apparently within 2 inches of the front of the radiator; her hands close to the top. It is all very suggestive to the recipients of the invitation card. Under the picture the words "Illustrated Truth," might have been put.

Amusement for Intelligent Invalids.

We have been the recipients lately of advertisement sheets from electric goods makers, which shows the interest of our friends in us, and an appreciation of the interest we take in them, or rather in their doings. Among the leaflets which someone has sent us is one—a neat little thing—on "Electric Cooking;" the distributors in this instance being the County of London Electric Supply Company. An invitation on the front suggests inspection of their show-rooms. Inside is an extract from "Anticipations" by H. G. Wells. He writes:

To-day, cooking, with its incidentals, is a very serious business, the coaling, the ashes, the horrible moments of heat, the hot, black things to handle, the silly vague recipes, the want of neat apparatus. One always imagines a cook working with a crimsoned face and bare, blackened arms. But with a neat little range, heated by electricity and provided with thermometers, with absolute controllable temperatures and proper heat-screens, cooking might very easily be made a pleasant amusement for intelligent invalid ladies.

The experience of Mr. Wells seems to have missed the advantages, in the way of simplicity, economy, promptness, and good results, of the gas methods of cooking. The second part of the quotation indicates that, when writing, he had not had experience of electric cooking. He did not know of the hundred-and-one instructions that it is essential to mark, learn, and inwardly digest before handling the electric-cooker—of the need to keep the oven door closed, to maintain a watchful eye on the thermometer, to endeavour to inspect things through a greasily steamed pane of glass, to keep an open eye on the signal lights, and to have a vast endowment of patience and care. We are struck by the suggestion that electric cooking might be made "a pleasant amusement for intelligent invalid ladies." Were it not for certain drawbacks, the idea would really be a brilliant one, and it might remove the monotony experienced by many an invalid. The practical woman, who studies domestic economy, who studies the purse, time, labour-saving, and reliability, will continue to use a gas-cooker. The serviceableness of the electric-cooker in providing amusement for intelligent—ripe intelligence is very necessary—invalid ladies is discounted by the strain on the nerves due to the extraordinary patience that has to be exercised, by the danger of shock, and by the irritability engendered by breakdowns. We are not at all sure that Mr. Wells was not a bit sarcastic when he wrote the words "pleasant amusement for intelligent invalid ladies." Perhaps someone will send him this paragraph; and so give him the opportunity of saying whether or not he was at the moment in serious mood.

Costs.

In the electric-cooking campaign, one of the most amusing things is the seductive costs that are published, without any precise statement as to the work done, together with the airy manner in which it is said that the costs compare with gas or coal. Yet—sly dogs that the electrical cooking advocates are—they will not show a sportsmanlike spirit, and have a public contest from the soup to the coffee (with a gallon or so of boiling water for "washing-up"), preparing equal quantities for all the courses in a dinner, so that relative costs and time and cooking efficiency can be duly recorded. The "Electrical Times" has published some figures as to American cooking costs. It is said that among the figures secured from private users were some showing remarkably low expense. One family of three, for example, carried out a week's cooking electrically at a cost of 73 cents (say 3s.); being equal to 24·33 units at 1½d. per unit. What the cooking for the family included is a matter that is regarded as being of no importance; and whether they had half or more of their meals away from home is not stated. A second family, using an enclosed cooker, is declared to have operated the device for a week at a cost of 19·5 cents (10d.). What nonsense to seriously publish a bare statement of this kind. We know a house in which, since a week before Christmas (gas cooking being the ordinary method), no cost has been incurred for cooking and water heating; the reason being that paterfamilias, wife, children, and servants have been staying elsewhere. There is just as much sense in publishing this statement, as in circulating those given in the "Electrical Times." In another case three dinners for four persons were cooked electrically at a cost for energy of but 8 cents (4d.). What constituted these dinners—sausages and mashed, or half-a-dozen courses, including (say) a turkey, or a pair of chickens? The absurdity of the whole thing must be apparent even to the intellects to which such figures are offered by our electrical contemporary. There is an editorial comment to the effect that the first example, in which 24 units were consumed in the week, "is particularly reasonable for a family of three, when it is considered that *all* the water needed was heated electrically during the period of test." Did not anybody in the house want a bath, or warm water for personal cleansing during that week, or water for washing linen or other things? However, the statement is considered by the "Electrical Times" quite good enough for its readers.

Downward Rays.

The inverted gas-lamp, with its fairly uniform candle power at all angles in the lower hemisphere, is found extremely useful on account of the good downward light that it gives, as well as the excellent general distribution it affords—quite apart from the low intrinsic brilliancy and the softness of the light. One circular recently received shows that the makers of Osram lamps are trying to match the excellence of the inverted gas-burner for desk and local work, so far as the downward light is concerned, but the intrinsic brilliancy and the harshness of the light they cannot overcome without depreciating the light-giving efficiency. The new lamp is known as the "Axial" wire-drawn lamp, which derives its name from the fact that the filament has been arranged at right angles to the axes of the lamp; thus throwing the light down, instead of, as in the ordinary lamp, largely in the horizontal direction. An opal reflector is used to intensify the downward light. It is asserted that a lamp giving 25 candles without the reflector will supply with it nearly 50 candles at angles up to 30° from the vertical. The lamp is no good with or without a reflector for general lighting, owing to the character of the filament suspension, and the consequent condensation of the area of illumination. The prices of 30 and 60 watt, reflector-fitted lamps are, for 200-250 volts 3s. 5d. each, and for 100-130 volts 2s. 11d.

The Art of Business-Getting.

At various times, we have commented on the influences and effects of the representation of members of electricity committees on other local public bodies, and the matter comes to the fore again in discussing, in an earlier column this week, the proposal made by Mr. Leon Gaster for a Central Public Lighting Authority for London. Without further remark, we may quote the following pertinent paragraph published by the "Electrical Times:"

The Islington Borough Council's electric supply undertaking has a stout champion in Alderman Lambert; and he has furthered its progress by every means in his power. Recently he was successful (as a guardian) in getting the Islington Board of Guardians to see the benefits which would result from the electric lighting of their poor-law institutions. Now, having got the guardians to see the force of the electricity argument, he has clinched the matter in proper style by taking the members along to see the generating station. They were, it appears, very much impressed, and discussed the matter in the course of an excellent dinner to which they were afterwards entertained by the Alderman.

A visit will be paid next Saturday by members of the Scottish Junior Gas Association (Eastern District) to the chemical-works at Falkirk of Messrs. James Ross and Co. After the inspection, the visitors will be entertained at tea.

NOTES FROM ABROAD.

U.S.A. Oil Prices.

The Consolidated Gas Company of New York has let the contracts for the whole of its requirements in gas oil for the present year at the price of 5½ c. per gallon, which is an advance of 2 c., or over 60 per cent. When it is taken into consideration that the Consolidated Gas Company and the Astoria Light, Heat, and Power Company use some 55 million gallons of oil in the year, it can be understood that this increase is a serious matter.

Gas Exhibition in Charlottenburg.

Under the auspices of the Haus- und Grundbesitzer Verein a gas exhibition was held in Charlottenburg on Jan. 14, 15, and 16. Some thirty firms from all parts of Germany showed the latest developments in gas apparatus for cooking, baking, heating, ironing, &c., and there was a fine display of all branches of incandescent gas lighting. The apparatus was all shown in actual working, lectures were given, and cookery demonstrations held. The exhibition was a great success and attracted large numbers of visitors.

Gas in Turkey.

In the "JOURNAL" last week under this heading appeared an announcement that there was an opening for a company to take up the supply of gas to Pera on the shores of the Bosphorus. The "Journal de l'Éclairage au Gaz" announces this week that a French firm, whose name is not given, has been granted the contract for a period of fifty years. A sum of £120,000 (Turkish) is said to have been paid for the concession, as well as the price of the works, and the fulfilment of the other conditions already stated. A Turkish joint-stock company will have to be formed for the purpose.

Coal Washing.

Bulletin No. 69 of the University of Illinois has been issued, and it is on the subject of coal washing. Literature on this subject was very scattered, but this work has been carefully compiled from a study mainly of the 85 washeries in Illinois. The theories of crushing, screening, and washing are dealt with, and the more important types of machines described. Valuable data are given for all branches of the work, with comparisons of costs and efficiency.

Responsibility for Sound Gas-Fittings.

An action was lately brought against the Economic Gas Company of Los Angeles (Cal.) by a lady who claimed $50,000 damages on account of permanent injury to her health through inhaling gas fumes issuing from defective gas-fittings. The defendants maintained that there was no cause of action, inasmuch as the city was responsible, owing to their neglect to properly inspect fittings installed by the plaintiff—an ordinance to this effect being on the statute-books. The Jury upheld this view.

Gas as a Water Sterilizer.

In the sale-rooms of the United Gas Improvement Company at Philadelphia there has been installed a Forbes gas appliance for sterilizing water, thereby rendering it safe for drinking purposes. Connected with the appliance is a mechanical contrivance, called a "dispenser," for holding paper cups, 5000 of which were ordered; and the distribution of them began on the 1st inst. Though the water coming from the sterilizer is pronounced to be "safe," it is not guaranteed to be chemically pure; only that all bacteria have been killed, and that nothing harmful is left.

German Company Statistics.

The Imperial Statistical Office has just issued particulars of German Companies from 1907 to 1912 inclusive, according to which there were 122 gas companies in the latter year, as against 116 in 1907. They had a total capital of Mk. 809,917,000 (about £5,900,000). This is an increase of 16·9 per cent. since 1907. By far the greater number of large and more profitable works are in municipal hands. Of the 122 gas companies in 1912, 108 shared a total profit of over Mk. 11,000,000. Only 5 of them showed losses, which amounted to Mk. 353,000, against 12 in 1907 with a total loss of over Mk. 3,000,000. In 1912, 10 electricity companies showed losses amounting to Mk. 1,893,000. Of the gas companies 113 were able to pay a dividend, amounting to 8·3 per cent. of their capital.

Breslau Gas Supply.

The report of the Breslau works for the year 1912 showed satisfactory progress. The gas consumption was 52,500,000 cubic metres [1854 million cubic feet], an increase of more than 9 per cent. over the previous year. The increase for lighting purposes was only 171,176 cubic metres, that for cooking and domestic heating being 929,051 cubic metres. There was a total increase in the profits of Mk. 408,494 [over £20,000], which must be considered as highly satisfactory. On March 31, 1913, there were 12,349 public gas-lamps in use. Suspension lamps were increased in number, and there was an extension of the Bamag distance lighting system, which has proved most satisfactory; the average nightly failures being only 0·35 per cent.

Heavy Leakage Losses.

The last report received of the Pavia (Italy) Municipal Gas-Works—that for the year 1911—is not altogether satisfactory; the profit for the year having been 56,950 lire [£2257], or about 30,000 lire below the estimated profit. The chief reason put forward is keen competition in the lighting business. In the seven years of its existence which were completed in 1911, the undertaking had contributed a sum of over 218,000 lire to the municipal funds. The most striking item in the report, however, was the serious loss due to unaccounted-for gas, which amounted to no less than 18·14 per cent. Even this was a reduction of 1·43 per cent. on the previous year.

Determination of Sulphur in Gas.

Two members of the staff of the Physical-Technical Institute at Charlottenburg—Herren Mylius and Huttner—have devised a new and simple method of estimating the sulphur in illuminating gas. It takes only 30 minutes to apply, and only a small quantity of gas is required. This is burnt with air in a quartz tube in presence of platinum sponge, and the sulphuric acid formed is received in damp powdered quartz. After washing this out with water, the solution obtained is titrated with a 1-1000 normal caustic soda solution, using an ethereal solution of eosine as an indicator. The gas used at the Institute contained sulphur in the proportion of 13·1 to 39·4 grains per 100 cubic feet.

Thawing of Frozen Gas-Pipes.

The last number of "Wasser und Gas" gives an account of some recent experiments in Helsingfors with the use of methyl alcohol for this purpose. It is stated that it has been customary for years to use ethyl alcohol, and that gas-works have spent large sums yearly on the spirit. Its use, however, is very expensive, and these recent experiments, as well as practical applications, have shown that methyl alcohol, a bye-product of sulphite cellulose factories, is more efficacious than the ordinary spirit used. In the laboratory experiment, 15 cc. of ethyl alcohol were mixed with 25 grammes of snow, and the temperature of the solution went down to − 22·5° C. When the same quantity of methyl alcohol was mixed with 25 grammes of snow, the temperature went down as far as − 32·2° C. If the prices are equal, therefore, it will be found far more economical to use the methyl alcohol.

Gas in Varnish Manufacture.

The "Gas Record" names a good use to which gas can be put. The varnish factory of W. P. Fuller and Co. in South San Francisco has just adopted gas for boiling varnish in the process of manufacture. By this means the same work is accomplished in thirty minutes that was done in one-and-a-half hours with coke—viz., the heating-up of 50 gallons of the varnish mixture. The burners are of the blast type, and are each 30 inches in diameter with twenty holes for ¾-inch nipples. The nipples connect to a burner head 3½ inches in diameter. Each burner head is drilled with forty small holes. By this means the entire bottom of each kettle is evenly heated. Air is supplied at 1 lb. pressure for combustion. The gas consumption with all sixteen burners working is 9600 cubic feet per hour, in which time 1600 gallons of varnish can be produced.

Superfluous Natural Gas.

According to a recent report of the United States Geological Survey, of which the "Ironmonger" gives a few details, it is estimated that some 25,430 million cubic feet of natural gas were used in 1912 in West Virginia, U.S.A., in the manufacture of carbon black. The gas is burned through common jet burners under a row of sheet-iron troughs, and, as insufficient air is supplied for combustion, a heavy deposit of unconsumed carbon is formed on the inside of the troughs. This is just scraped off and packed for sale. The value of the gas thus consumed in 1912 was estimated at about 2·2 c. per 1000 cubic feet at the well mouth. This seems to be a most wasteful use to make of the natural gas, but there is said to be no market for it in the vicinity, and that there would be no financial advantage in supplying it to distant consumers in pipe lines.

Fertilizers in Germany.

According to an abstract in the "Engineer" of a paper read some weeks ago by Herr Wolff before the Verein deutscher Eisenhüttenleute, Germany consumes annually more than £8,000,000 worth of Chili saltpetre over and above the 500,000 tons of sulphate of ammonia produced in the country itself and used for fertilizing purposes. In spite of this, the demand for these nitrogen compounds always exceeds the supply. The nitrogen contained in coal is recovered in a very small proportion when the coal is distilled in coke-ovens, in which only from 13 to 15 per cent. of the total nitrogen is obtained. On the other hand, in the Mond producer, 70 per cent. of the nitrogen in the coal is converted into ammonia; and the market value of the ammonium sulphate recovered from Westphalian coal is almost equal to that of the coal itself.

Collecting Gas Rentals.

The "Journal für Gasbeleuchtung" for Feb. 14 describes a new machine by the Fakturier und Rechenmaschinenwerke, of Düsseldorf, which is intended to simplify and reduce to the work of one man what is generally done by three—viz., reading the meter, making out the account, and collecting the money. The machine, which is of convenient shape for carrying, and weighs less than 7 lbs., is taken to the house. By means of small levers the last quarter's reading is set on the machine, the present quarter's reading, the price of gas, meter rent, and any other special charges. The machine does the rest, adding, subtracting, and multiplying, and the amount due to the company is shown and

written mechanically. This reduces to a mechanical operation what cannot so readily be entrusted to the average inspector. Each separate figure—the meter readings, price of gas, &c.—is clearly visible when set, and the mechanism is all enclosed, and cannot be interfered with.

Busy Gas Demonstrators.

It is stated by "Gas Logic" that during the year 1913 no fewer than 80,723 homes in Manhattan and the Bronx were visited by gas demonstrators, for the purpose of instructing the female portion of the population in cooking by gas, and the economical use of gas for other domestic purposes. The average number of calls of each demonstrator in the year was about 4500.

Gas Propaganda Work in Paris.

The Paris Gas Company distributed to all their consumers last year an illustrated calendar; and it met with such success that they had prepared for the current year a tastefully illustrated *brochure* in which particulars are given of the principal uses of gas. Inserted in it is a plan of Paris, indicating the positions of the Company's show-rooms, works, district offices, &c. About 700,000 copies were printed and distributed. In addition, a large number of special publications were prepared last year. For example, illustrated particulars in regard to the heating of bakers' and pastry-cooks' ovens by gas; a manual of gas cooking; instructions on the use and care of cooking-stoves; and an illustrated booklet showing the various applications of gas for lighting, culinary, and industrial purposes. With the view of securing a new class of customers, the publicity staff of the Company have been in communication with the caterers' syndicates, who have regularly inserted in their organs a series of articles directing attention to the new gas appliances suitable for use in the large kitchens of hotels and restaurants. The preparation of these publications has necessitated the taking of a number of photographs on the consumers' premises; and reproductions of them are on view at the show-rooms of the Company.

WORKS TOPICS—XXI.

By "Modus Operandi."

New Type of Exhauster.

Very interesting is Mr. Foster's description of the turbo-driven fan type of exhauster, which has lately been installed at the Windsor Street Gas-Works of the Birmingham Corporation. Seeing that it costs less than half as much as the corresponding engine and exhauster of the usual pattern, and that it occupies only one-tenth of the space taken up by the latter, it would appear to be a notable improvement, which should be considered in other quarters. Experiences of this sort are very valuable, and it is the publication of such information that enables up-to-date engineers to instal new plant on thoroughly modern lines when the opportunity occurs.

Mr. Foster's experiences with his large exhausters would appear to have been unusually bad; for, generally speaking, the exhauster is a very well-behaved apparatus. Most engineers have plenty of opportunity of forgetting the details of the interiors of their exhausters; for on rare occasions only is it necessary to shut them down for repairs. As a general rule, the gas, in passing through an exhauster, contains sufficient tar to lubricate (with the addition of a little oil and tar oil) its working parts. The hotter the gas, and the more tar it contains, the better will the exhauster work. So much so is this the case that, given a high enough temperature, no lubricating oil will be necessary. Presuming that the gas is above 80° Fahr. in temperature, very little lubricating oil will be required, should a moderate amount of tar oil be used. This has the effect of thinning the tar inside the exhauster, and of preventing any coagulation that might otherwise take place and cause friction.

It is easy to understand that, in cases where an exhauster is working on a gas that has been freed from tar, the question of proper lubrication might well be troublesome. For this reason, it is an advantage to have condensing plant both on the inlet and the outlet of the exhausters, and, further, to fix the tar-extracting plant on the outlet of the exhausters. In such cases difficulties with exhausters and expense on lubrication are both practically non-existent. The figure of £160 a year, which Mr. Foster estimates will be the saving on lubricating oil alone as the result of using the new 500,000 cubic feet per hour turbo-exhauster, will seem extraordinarily heavy to other engineers who are not spending more than £5 a year on such lubrication. It is, of course, the result of working on a tar-freed gas.

In other respects, too, the new type of exhauster is an efficient form of apparatus; for it is clear that it maintains a very steady vacuum, the steam consumption is small, and the wear and tear is not expected to be heavy. One may, therefore, reasonably hope to hear in the near future of its installation in other works.

Low-Temperature Distillation.

Mr. Ormandy's paper on "Motor Fuels" [see "Journal" for Feb. 10, p. 369] introduces, as might be expected, the subject of gas-works products and the possibilities in connection therewith. The author states that "it has been proposed to take out the benzene in the coal gas." He does not, however, approve of the suggestion, and very rightly too; but it is quite wrong to assume that gas engineers wish to reduce the illuminating and heating value of the gas to a drastic extent, such as would result from an extraction of the benzene. As a matter of fact, there is no wish to reduce the standard of the gas; but it is desired to obtain the necessary freedom so as not to be hampered in giving the consumers the best possible supply at the lowest price.

No drastic reduction in the heating value of the gas should even be contemplated; for were it to become an established fact, I fail to see that, under existing circumstances, more B.Th.U. could be supplied for one penny. Assume for one moment that the calorific value of the gas were to be lowered by 30 per cent. Could the price be reduced by 30 per cent? Of course it could not. Every consumer would have to use 30 per cent. more gas to obtain the same result. Many of the mains and services would be 30 per cent. too small. Gasholder storage would be 30 per cent. smaller, and a great deal of the works plant would require radical alterations to cope with the additional quantity. All existing appliances would be quite unsuitable for such a gas, and a great many of them would have to be scrapped. In my opinion, the extraction of benzene from coal gas would be a futile proceeding, and quite unthinkable.

If gas-works are to provide motor spirit—and in this connection Mr. Ormandy stated that "many of the large collieries and some of the gas-works are experimenting continuously with such low-temperature distillation processes"—it is far preferable for a proper plant to be installed and worked with this end in view. The process is one analogous to that of gasmaking; and the skilled gas-works carbonizer would take to a new system of this kind like a duck to water. This matter of at least investigating these new processes should not be shirked by the large gas undertakings. If, as in my opinion appears probable, a thoroughly practical process will be evolved, gas companies should be interested in it. One fundamental advantage of these low-temperature systems is that the heat employed for carbonizing is sufficiently low to allow iron and steel to be employed inside the retorts that are used. As a result, mechanical methods for conveying the coal through the retorts or ovens can be adopted with perfect success. In practice, this is of very great importance; for by its means all sticking of the charge is prevented, and by keeping the coal continually on the move a much higher capacity per retort is obtainable.

Purification by Scrubbing Plant.

There is one aspect of purification which would appear to be very much neglected in even the most up-to-date works, and that is the use to which the ammoniacal liquor is put before being delivered to the sulphate plant. It is, of course, a well-known fact that ammonia has a fairly strong affinity for the acid gases CO_2 and SH_2. Although this is generally recognized, surprisingly little use is made of the fact. It is quite usual to allow the liquor to run direct from the retort-house, the condensers, and connecting mains, into the storage well without attempting to utilize the purifying properties of the ammonia contained in the liquor. As a consequence, the liquor for this purpose is to a large extent wasted.

Much better is it to collect the retort-house and condenser liquor, and, having first separated the tar, to circulate it through the washing and scrubbing plant. The result would probably surprise most gas engineers, and it would be found that, in many cases, 30 to 60 per cent. of the purifiers' work had already been effected by the preceding plant. In my own works, it is usually found that the scrubbing plant is doing as much extraction of SH_2 as the purifiers, and in this way they become a very valuable auxiliary. Considering that in the case in question the sulphuretted hydrogen in the gas averages considerably less than 300 grains per 100 cubic feet on the inlet to the purifiers, it will be conceded by most that this figure is exceptionally low. With an alteration in washing and scrubbing plant, I have no doubt that this could be substantially reduced. As a matter of fact, one of the best-known makers of washing and scrubbing plant gives particulars of a number of tests at different works, from which it is seen that any quantity from 50 to 100 per cent. of the SH_2 can be extracted in an efficient washer-scrubber; the whole of the ammonia being removed at the same time, together with from 28 to 80 per cent. of the carbonic acid. Such figures are excellent, and should be investigated by engineers, and especially by those who are short of purifying plant.

In those cases in which the ammoniacal liquor is sold to chemical manufacturers, it must not be overlooked that the revenue derived from the sale of spent oxide will be reduced in direct proportion to the amount of SH_2 extracted in the scrubbing plant. In such cases it would be necessary—and, even in existing circumstances, it should be borne in mind—to make arrangements to be credited with the value of the sulphur contained in the liquor. Where, as is usual, the liquor is worked up into sulphate of ammonia, this sulphur is obtained from the waste gases, either in oxide purifiers or Claus kilns; so that in most works this question of possible loss need not be considered.

The recent issue of new ordinary stock by the Newcastle-upon-Tyne and Gateshead Gas Company was very successful; being more than 30 per cent. over-subscribed. One pleasing feature was that out of 700 tenders received nearly 500 were from the Company's own consumers. The aggregate amount which they applied for was £77,000 out of the £100,000 offered.

CARBONIZATION IN BULK FOR GAS PRODUCTION.

RECOMMENDATION FOR ADOPTION OF BULK CARBONIZATION.

By G. Stanley Cooper, B.Sc.

[A Lecture delivered before the London and Southern Junior Gas Association last Friday.]

The general tendency of carbonization in recent years has been to work with increasing quantities of coal per charge; and it is now the usual practice to work with full retorts. Largely, too, owing to continual labour troubles, mechanical coal and coke handling plants have been widely adopted, and such adoption has necessarily led to great improvements being made in all these mechanical arrangements, and a high state of efficiency with a minimum amount of attention can now be obtained. The necessity, therefore, of employing mechanical labour-saving devices has been one of the factors which has helped forward the system of carbonization in bulk for gas production. Again, it has long been recognized that an enormous loss of gas takes place in the retort-house every time a retort is charged. Filling the retorts reduces the number of charging operations, and hence saves a large amount of gas. By increasing the charge—say to 10 tons—as is the case in bulk carbonization, the number of charging operations is considerably reduced; hence less labour is required, and there is less loss of gas.

Efficient Mechanical Handling.

The question now arises whether charges of 10 tons of coal, and the resulting 6 or 7 tons of coke, can be satisfactorily handled. Undoubtedly they can, owing largely to the fact that long experience in such handling has been gained on coke-oven plants, and the requisite machinery has reached a very high degree of efficiency. It will also be asked whether the results obtainable are sufficiently encouraging to warrant the adoption of bulk carbonization. By results is meant the quantity and quality of the gas, coke, tar, ammonia, &c., and not the gas only. I shall show at a later stage that, taking all these together, the results of bulk carbonization are every bit as satisfactory as those obtainable by the ordinary systems of carbonization. I should here point out that in bulk carbonization, although the same amount of gas can be obtained as by other systems, the candle power of the gas is usually slightly lower. But, in these days of incandescent lighting, candle power is only of minor importance.

Calorific Power Important.

It is the calorific power which counts, and, as far as this factor is concerned, all requirements can be met. It must not, however, be imagined that with bulk carbonization the gas produced is devoid of illuminating power, as this is far from being the case. It is not at all difficult to maintain a standard of 14 to 16 candle power measured by the No. 2 "Metropolitan" burner, and this is quite sufficient for ordinary requirements.

Gas-Ovens—Not Coke-Ovens.

I wish it to be distinctly understood that in this paper I am not referring to ordinary coke-oven carbonization, but bulk carbonization in chambers specially built for the purpose of gas production. Ordinary coke-oven gas as usually made often contains up to 10 per cent. of nitrogen, and much carbon dioxide; and consequently its illuminating power and calorific value are both lower than is desirable in gas for town purposes. The cause of this is that no proper precautions are taken to exclude all air from the ovens. On gas-ovens proper, however, the doors are quite gas-tight, and consequently the composition of the gas does not suffer.

Inclined Ovens.

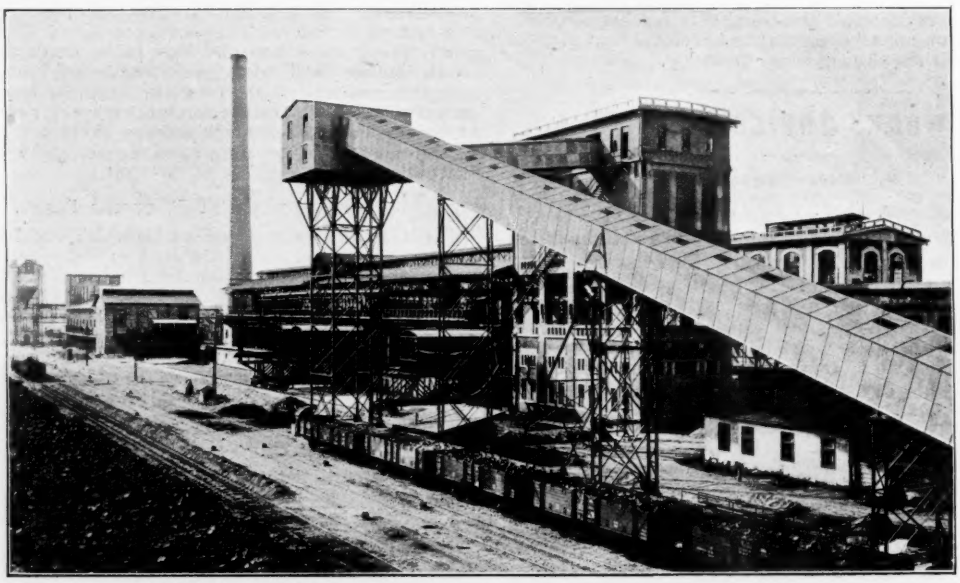
In the early days of bulk carbonization, the large chambers used were built on the inclined principle; but many difficulties accompanied the adoption of this system. Consequently, in some cases it was discarded, and horizontal chambers were used. Munich chambers are, however, still built inclined, and good working results are obtained with this system.

Koppers Horizontal Chamber Ovens.

I propose now to give a detailed description of the Koppers horizontal chamber oven, which has been adopted in a number of large cities in Europe and America. At Birmingham there is an installation of 66 ovens, at Vienna one of 72 and one of 46, and at Budapest one of 78. I propose to refer to these various plants in my description, and to show, by means of the lantern, different views of these works.

Development from Coke-Ovens.

In order to give a better understanding of Koppers gas-ovens, it will be desirable to explain briefly their development from the Koppers' regenerative coke-oven; and it will be seen how the vital principles of construction and working, which have been found to be quite satisfactory in the coke-oven, have been applied in the case of the gas-oven.



GENERAL VIEW OF THE COAL-HANDLING PLANT AT BUDA-PESTH.

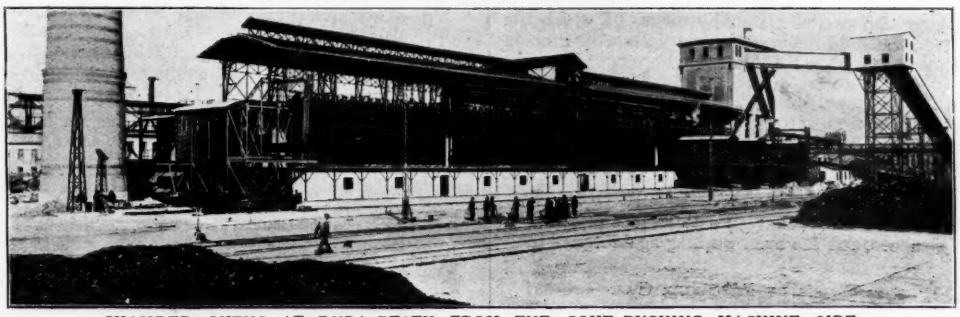
The Koppers Regenerative Coke-Oven.

The Koppers regenerative coke-oven* is of the vertical-flued type, and differs in many ways from other ovens, more particularly as regards the arrangements of heating flues and regenerators, and the facilities for inspection. The oven is a chamber 10 metres long, 2 metres high, and about 0·5 metre wide. The height and width vary somewhat according to the class of coal to be coked. Each oven is capable of taking a charge of about 8 to 10 tons of coal. The ovens are heated by the gas evolved from the coal during carbonization, and the means adopted for distributing and regulating the supply of gas, together with the method adopted for preheating the air required for combustion, are special features of this oven. The gas and air for combustion are separately distributed on each side, and along the whole length of the oven, and combustion is caused to take place in each vertical flue. Each oven wall is formed of about thirty vertical flues, and, there being a gas-jet in each flue, each oven is heated at about sixty points. At the top of the oven and over all the vertical flues, openings are provided for giving access for inspection and regulation.

Regulation of Combustion.

Very simple means are provided for the regulation of combustion in each flue, which is such that it is easily possible for the

* The lecturer exhibited a number of drawings illustrating the construction of the ovens—many of which appeared in our report of the paper he contributed last autumn to the Junior Institution of Engineers—see "Journal," Oct. 21, 1913, pp. 236-8.



CHAMBER OVENS AT BUDA-PESTH—FROM THE COKE-PUSHING MACHINE SIDE.

walls of the oven to be absolutely uniformly heated from end to end.

Uniformity of Heating.

Uniformity in the heating of the ovens not only results in the production of a homogeneous coke, but enables the charges of coal to be burnt-off more quickly than in ovens where such uniformity does not prevail. Besides this, it effects great economy in the consumption of the heating gas. The air for combustion is heated to a high degree in regenerators designed on the Siemens principle.

Separate Regenerators.

The distinguishing feature of the Koppers regenerative oven lies in the employment of separate regenerative chambers for each oven. This construction permits of the air for combustion and the chimney draught being separately regulated.

Distribution of Gas and Air.

The air for combustion flows along passage ways at the front and back of the oven, and thence it passes into the regenerators, where it is heated to about 1000° C. [1832° Fahr.] The highly heated air passes out of the regenerators into the vertical heating flues. Part of the gas evolved from the coal is used for heating the ovens, and, after being purified, this gas is returned from the bye-product plant to the ovens by mains running along the whole length of the ovens on each side. Branch supply pipes conduct the gas into the gas-distributing channels, which are situated directly beneath the oven walls. Thence it passes through the gas-nozzles into each vertical flue, where it ignites with the hot air from the regenerators. A jet is therefore formed on a level with the oven floor in each of the heating flues of the oven chamber.

Reversal with Regenerators.

The employment of regenerators renders it necessary to reverse the heating process after a period of time—usually about thirty minutes—and the heating flues are divided into two sections, so that combustion can take place alternately in each half of the oven wall. When the gas is burning in one-half of the wall, the products of combustion pass up the flues and enter the top horizontal flue, whence they make their way down the flues in the other half of the oven wall and enter the regenerator through the same passage by which the air is admitted to the flues when the direction of combustion is reversed. On issuing from the regenerator, the waste gases pass into the flue leading to the chimney, after giving up their heat to the fire-brick chequer-work. When the next half-hourly reversal is made, the heat is given up to the air entering for combustion.

The Koppers Regenerative Gas-Oven—Aims on Gas and Coke Works.

In coke-works the principal aim is, of course, to produce the best possible quality of coke suitable for metallurgical purposes. The gas obtained is used principally for heating the coke-ovens, for boiler firing, and for gas-engines. In gas-works, on the other hand, the principal object is the production of the greatest possible amount of illuminating gas; and the coke obtained is regarded more or less as a bye-product. Mr. Koppers saw that, by making slight alterations in design and practice, his coke-oven could be adapted for use as a gas-oven, and could as such be rendered capable of producing a high yield of gas of good and even quality, and suitable in every way for town purposes. At the same time the coke obtained would deteriorate in quality hardly at all, and would be far superior to ordinary retort coke.

Heated by Producer Gas.

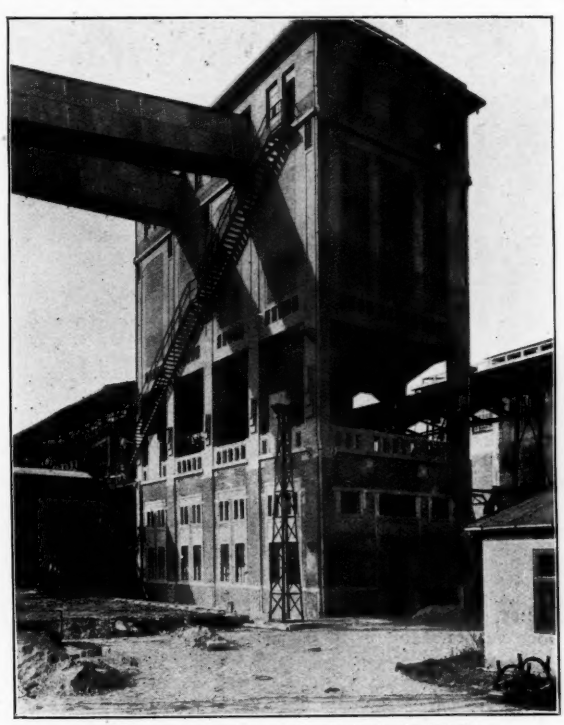
The most important alteration thereby necessitated was that the whole of the gas evolved from the charge should be available for illuminating purposes; and hence some other means must be found for heating the ovens. Mr. Koppers decided that this was best dealt with by the introduction of a central producer-gas plant, erected quite apart from the chamber ovens. The producer gas was further to be preheated before combustion, just as the air is preheated in the case of the regenerator coke-oven. Consequently the design of the oven was altered slightly in order to accommodate these new features. In the main, however (especially as regards the arrangement of the heating flues), the oven remains unaltered.

Construction and Working, and Divided Regenerators.

In the gas-oven the regenerator chambers are arranged so that gas is preheated in one regenerator, air in the next, then gas, and so on throughout the length of the battery. Each regenerator is further divided into two sections by a partition wall; each section being connected by a pipe to the heating flue. Air and producer gas enter through separate pipes, as in the case of the coke-oven. The gas and air, after passing through the chequer brickwork in the regenerator and becoming heated to about 1100° C., issue from their respective pipes into the heating flue, where combustion takes place. As in the case of the coke-oven, combustion takes place alternately in each half of the oven wall, and the products of combustion pass into the horizontal flue down the vertical flues of the second half of the oven wall, thence passing into the regenerator chamber. After giving up the surplus heat to the brickwork of the regenerator, the gases pass away to the chimney at a temperature of about 235° C. Owing to the fact that the producer gas as well as the air for combustion is preheated, great economy in consumption of the heating gas is effected, thereby reducing the fuel charges very considerably.

Means of Regulation.

The supply of gas and air to each vertical flue can be regulated to a nicety by adjusting the gas-nozzles, while the supply of gas to each distributing flue is regulated by means of cocks placed at



Coal-Storage Bunker at the Buda-Pesth Works.

the front and back of the ovens, and in such a position that they can easily be attended to without any discomfort to the workmen. The supply of air to each distributing flue can be adjusted as required by means of sliding bricks, placed over each flue, and is also regulated by means of dampers in the passages leading to the regenerators. The construction and working of the Koppers' oven is exceedingly simple. The oven walls consist of a series of hollow columns reaching from the top to the bottom of the structure; thereby assuring the strongest possible construction and resistance to strain. All the other parts of the ovens are made as strongly as is compatible with requirements. Every working part of the oven can be inspected without difficulty and without discomfort.

Charging of Chambers.

The chambers are charged by means of a machine which runs on top of the setting. This machine has three hoppers, charging into corresponding openings in the chamber; and the coal is then levelled by another machine which travels alongside the setting.

The latter machine also carries a ram by means of which the mass of coke is discharged from the oven into a quenching machine. In some cases—as at Birmingham, for example—compressed coal is charged into the ovens, and a good metallurgical coke is produced. Working with a charge of 10 tons of coal per oven, a carbonization period of twenty-four hours is required; and at the end of this time the charge is quite burnt off. The coke obtained is of excellent quality; and, owing to the minimum amount of handling it undergoes, very little breeze is produced. The efficiency of the charging machinery is such that each oven can be completely discharged, recharged with 10 tons of coal, the ascension pipes cleansed, and the oven working again in less than ten minutes.

Heating of Ovens by Producer Gas.

As already pointed out, the ovens are heated by producer gas, made in a separate producer-gas plant. The great advantage of this system is the fact that coke breeze and low-grade fuel generally can be used in the producers without lowering the efficiency of the plant. The producer gas is cleaned before use, in order to prevent the deposition of dust in the heating flues, and the consequent damage by fusion of the dust with the fire-brick material. It can be further arranged that the ammonia formed in the producer is removed from the producer gas before use, thereby lowering the working costs of the producer plant.

Kerpely Producers.

In connection with the whole of the installation of Koppers ovens on the Continent, the Kerpely gas producer is employed. The Kerpely producer has been specially designed for the gasification of fuel of the lowest grade. Its principal features are as follows: (1) The revolving mechanical grate and water-cooled jacket; the latter preventing the adhesion of clinker to the sides of the producer. (2) The automatic ash discharge, which considerably reduces the labour costs. (3) The duplex air and steam supply, which allows of the regulation of gasification, and secures uniform combustion over the whole grate area.

Combustion of Producer Gas.

Owing to the loosening effect of the grate, the blast is uniformly distributed, and consequently the composition of the gas made varies very little indeed. The following is an analysis of an average sample of the producer gas:

CO	29·84 per cent.
H	9·12 ,, ,,
CO_2	2·78 ,, ,,
CH_4	0·80 ,, ,,

The calorific value is about 137 B.Th.U. per cubic foot.

At Birmingham, Mond producers are used with great success, and the ammonia is recovered from the producer gas before use. By this means the cost of the fuel is defrayed by the sulphate recovered. With installations of Koppers chamber ovens it is possible to arrange that all the work of charging and discharging the ovens shall be done during the daytime. At the Simmering Gas-Works, Vienna, the charging of eighteen Koppers ovens is all done during three hours in the morning and two hours in the afternoon.

Advantages of Bulk Carbonization.

The advantages of bulk carbonization in horizontal chamber ovens may be summarized as follows:—

1.—The labour costs are reduced considerably owing to the use of mechanical appliances, and to the fewer number of charging and discharging operations.
2.—Low fuel consumption and cost, as the ovens can be heated by gas produced from coke breeze and low-grade fuel.
3.—The coke produced can be used for metallurgical purposes.
4.—The tar produced is of a light, fluid character, and contains a very small amount of free carbon.

Results Obtained.

With regard to the results obtained on plants of this description, I give herewith figures taken from a table which embodies the results of a test carried out on eighteen ovens at Vienna over a period of six days.

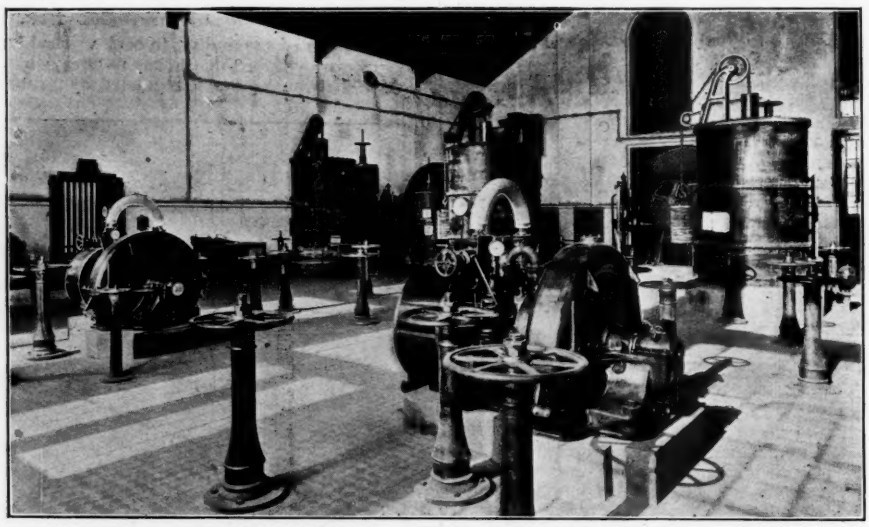
Quantity of coal charged		1169·76 tons
Quantity of coal charged per oven per day		10·83 tons
Time of carbonization		23 hrs. 35 min.
Production of gas per ton of coal corrected to N.T.P. (coal containing moisture and 8 per cent ash)		11,833 cubic feet
Calorific value (average) per cubic foot		612 B.Th.U. gross
Analysis of gas	CO_2	2·6 per cent.
	C_nH_m	2·93 ,, ,,
	O_2	0·37 ,, ,,
	CO	9·17 ,, ,,
	H_2	53·27 ,, ,,
	CH_4	28·20 ,, ,,
	N_2	3·48 ,, ,,

The yield of ammonia obtained at this plant is higher than on other plants from the same coal, while the tar is far superior to ordinary retort tar. It is of a light, fluid character, and contains only a very small amount of free carbon—usually not more than about 5 per cent.

It must be remembered that Austrian coal is, comparatively speaking, a poor gas coal. At Birmingham the yield is over 12,500 cubic feet per ton of 14-candle gas, with a calorific value of 550 B.Th.U.

Direct Recovery at Buda-Pesth.

At the new gas-works at Buda-Pesth a very interesting development has taken place—viz., the adoption of the Koppers direct-recovery process for the recovery of the ammonia from the gas. This is the first instance of a large gas-works adopting the direct process; but it is sure to come into more general use in the near future.



THE EXHAUSTER HOUSE AT BUDA-PESTH.

I give herewith a brief description of the direct recovery process as adopted at Buda-Pesth. The hot gas from which the tar and ammonia are to be extracted leaves the ovens and passes through ascension pipes direct into a collecting main of the dry type. Tar is kept circulating through this main to prevent the deposition of pitch. From the collecting main the gas enters a series of water-coolers of the multitubular type, where it is cooled to atmospheric temperature, thus bringing about the condensation of the tar and aqueous vapour. The gas is then drawn by an exhauster, and driven forward to a tar-extractor, in which the remaining traces of tar are effectually removed. After leaving the tar-extractor, the gas passes through a reheater, where it becomes heated to such a degree as to permit of the gas being delivered direct into the saturator without condensation taking place. The ammonia is extracted from the gas by direct absorption in sulphuric acid, and is recovered in the form of sulphate. The salt is automatically removed from the saturator by means of an ejector working either with steam or compressed air. The sulphate is delivered on to a collecting table, and then into a centrifugal dryer, where it is completely freed from mother liquor.

Products of Condensation.

The products of condensation extracted in the cooling and tar-eliminating operations are drawn off from the condensers, tar-extractors, &c., and are conveyed into a separating tank, where the tar and ammoniacal liquor separate, owing to their different densities. The tar flows into a storage tank and the liquor into another storage tank. The liquor is pumped to an ammonia still, where

the ammonia is driven off by steam and lime, in the usual way. The vapours of distillation are conducted from the still, and are delivered into the gas-main, where they mix with the heated gas, and the whole then passes into the saturator.

No live steam is necessary in the Koppers process either for reheating the gas after cooling and tar-extracting, or for distilling the ammoniacal liquor. For both these purposes the exhaust steam from the engine driving the exhausters is more than sufficient. No tar is deposited in the saturators; and the salt produced is of first-class quality, and is snow white. The gas passes out of the saturator, and is conducted to purifiers, where it is dealt with in the usual way for sulphuretted hydrogen.

DISCUSSION.

The PRESIDENT (Mr. S. A. Carpenter), in introducing the lecturer, remarked that the Association were under a debt of gratitude to Mr. Cooper for coming to give them a lecture. During the last generation, carbonization made great strides. The necessity for cheap gas as a fuel and the competition of electricity was largely responsible for this; and in addition there was the increased cost of coal, which had made it essential that the highest possible yield from it should be obtained. It was not very long since a make of 10,000 cubic feet of gas per ton was considered quite good, and a yield of 11,000 cubic feet was regarded with a certain amount of suspicion. These figures had now been left well behind; and he would be a very bold man who maintained that anything like finality had been reached. Everyone interested in carbonization was on the look-out for a means of further increasing the yield of gas from the coal. Consequently, any new system demanded very careful consideration from those interested; and for this reason the Council had for some time been casting about for a paper on coke-oven practice or carbonization in bulk. Some difficulty had been experienced in finding anyone to give such a paper; but they had at last been able to get Mr. Cooper to come from Sheffield and do so. He was connected with the Koppers coke-oven works, where these plants were made, and had had great experience both in the construction and working of them. In the North and Midlands there were a number of the plants installed; and a very large one at the Saltley Gas-Works of the Birmingham Corporation would come to their minds. The chief advantage of this method of working was, of course, to be found in the kind of coke produced. It was very clean and hard, and specially suited for foundry purposes. Very heavy charges were employed, and so to produce a given amount of gas fewer operations were necessary. It was common knowledge that every time a retort was charged there was a certain amount of gas lost at the mouthpiece; so that if they could reduce the number of operations it should be possible to secure a bigger yield per ton. There was another point. These settings were heated with producer gas which could be made from coke breeze and low grades of fuel. This, of course, meant a big saving on the fuel account. It was also possible to have day working only. From these points, it was easy to see that coke or chamber ovens had very favourable claims to consideration. On the other hand, if foundry coke only could be produced, it was to be feared that in the South the demand for this was limited. Mr. Cooper stated, however, that it was quite possible to still produce the same kind of coke as was obtained in ordinary gas-works carbonization. It was simply a question of working. He added, on the conclusion of the lecture, that Mr. Cooper would be pleased to answer any questions on points as to which the members would like further enlightenment.

Mr. F. C. BRIGGS (Gaslight and Coke Company) asked if Mr. Cooper would point out to them what he meant by "total results," and what he regarded as the chief advantages of his plant over and above any plant to be seen in ordinary gas-works. More particularly, what would be the carbonizing wages per ton with this plant? With reference to calorific and illuminating powers, he understood that wherever they were using these plants on a gas-works, they were supplemented by ordinary gas-works plant to maintain a constant value. Was it possible, charging all the twenty-four hours at equal intervals, to obtain a gas of constant value? If not, how was a constant standard kept to? Was it necessary to have sufficient storage to mix up the whole of the gas given off, and then afterwards send out a gas which was throughout of the value that Mr. Cooper had given them—about 550 B.Th.U.?

Mr. W. A. VANNER (Walton-on-Thames) thought the lecture was one which they could not very well discuss in the South, because they had not had any practical experience of the system dealt with. At the tail-end of the charge, the gas was utilized for heating the setting or battery; but he could not quite follow how the supply was regulated. He understood it was taken off by a second ascension-pipe, and would imagine that if there was a volume of gas, pressure would be experienced in the setting.

Mr. J. HEWETT (South Metropolitan Gas Company) inquired as to the life of the plant.

Mr. ERNEST SCEARS (Hampton Court) asked whether the lecturer could give them the details of just how the charge tailed-off—what the production was at the beginning of the charge and at the end, not only in quantity but also in quality, especially as regarded calorific power. Another point of extreme importance was the carbonizing costs per 1000 cubic feet. Probably this was the direction in which great improvement was to be found in this plant compared with ordinary gas-works plant, because in other ways he could not see that there was very much to be followed up. The demand in the South for metallurgical coke was very small indeed; and what was required could well be produced in chamber settings, or some settings of the kind, in just sufficiently small quantities to meet the demand. Even if there were a small market for this coke, the extra price obtained was, he believed, only a matter of 2s. or 3s. per ton. He would also like to ask what was the naphthalene content of the gas produced from coke-ovens and such settings. He believed at any rate in horizontals which were packed with coal the amount of naphthalene was very small. With such heavy charges as those mentioned in the lecture, he would expect the quantity to be very small too; and this was a point to be considered in comparing the system with ordinary gas-works practice.

Mr. F. A. FROST (South Metropolitan Gas Company) asked what proportion of the total amount of ammonia evolved from the coal went direct into the saturator as gas, and what was recovered in the liquor well from the products of condensation, and how this quantity in the well was dealt with afterwards. Was it treated by the aid of a supplementary sulphate of ammonia plant?

Mr. BRIGGS said he would be glad to have some idea of the effect of the process on the bye-products—chiefly on the cyanogen and ammonia yield. Also the temperature at which the effects were noticed.

Mr. D. C. CROSS (Lea Bridge) inquired whether these plants could be fixed up on small gas-works. He thought most of them would be struck with the fact that there was a tremendous amount of ironwork and conveyors, and that for small gas-works the idea would be no use unless smaller machines could be installed. The initial cost, he should say, must be enormous as compared with horizontals. How was the gas taken away from the chamber? Was an anti-dip arrangement or a hydraulic main employed?

Mr. COOPER, in reply, said he was quite aware that there were a number of points which he had missed out. It was not possible, within the short space of an hour, to cover the whole of a carbonizing system which was absolutely new to the majority of the members. With regard to the advantages of the system, and what was meant by "total results," he could answer this best by stating what they had done in Birmingham, and what they had just done in Buda-Pesth. They took the gas production, and the products, and made out a sort of balance-sheet against any other installation. In the case of Birmingham, most of the figures were set against the test-plant figures; and in this way his firm got a balance-sheet as favourable as anyone else's on results. Then he was asked what the other advantages were. Principally, of course, the advantages were those which came from mechanical handling. Take the Buda-Pesth plant, for instance. Mr. J. W. Morrison, of Sheffield, had only recently been quoting some figures for his horizontal retort plant of 5 million cubic feet capacity per day, and said he employed 43 men. The Buda-Pesth plant was of a capacity of from 9½ to 10 million cubic feet per day, and there were employed on it 31 men; so that it possessed a very great advantage from the labour point of view. The whole of the appliances used were highly efficient; and the charging and discharging, and so on, were very simple, when one employed machinery of the type that was put in for these plants. He had not by him exact figures of costs, because most of his firm's plants were erected on the Continent; and he found it was worse than useless to make comparisons taking the Continental conditions and the English conditions. But figures had been got together on the Continent; and the carbonizing cost with chamber ovens was probably less than one-half of that obtaining with horizontals, and less than two-thirds of that obtaining with verticals. As they had seen, the labour cost was very much lower; and this was one of the principal items that had to be taken into account. Again, they were able to get a fuel consumption of 10 per cent., and to use low-grade material, as against 12 to 13 per cent. with verticals, and horizontals anything, using a decent class of coke. The coke produced was, of course, unquestionably far superior to ordinary retort coke. One gentleman had remarked that it was only worth a few shillings per ton more; and so it was. But 80 per cent. at least, and probably more, of the coke discharged was worth 3s. or 4s. per ton more; and one only got 60 or 70 per cent.—he thought 70 per cent. was on the high side—for which the best price was obtained with an average installation of retorts. The ammonia produced was quite equal in quantity, and quite as good, as that obtained in gas-works practice; and the tar was quite equal in quantity, and far and away superior in quality. The free carbon content, which determined very largely the value of the tar, was only about 3 per cent. with chamber ovens, as against anything up to 30 per cent. with retorts. It seemed to him, therefore, that, as far as advantages were concerned, his side had a fairly strong claim. Mr. Briggs appeared to have got the impression that it was necessary to have a supplementary plant to maintain a fair average for the gas. This was, however, not the case. It so happened that in most instances—in fact, he believed it was so in every case—where they had installed chamber ovens there was a supplementary plant; but this was a mere chance. His firm were not afraid to place sole reliance on chamber ovens. In fact, Middlesbrough were not putting in chamber ovens, but coke-ovens; and they were placing reliance on a thing far more liable to mishap than chamber ovens. With regard to the effects on the cyanogen and ammonia, he could only quote the Birmingham and Continental experience, that the bye-products were quite equal to what they had been accustomed to get with any of their other systems. The temperatures in the

vertical heating flues ranged from 1200° to 1400° C., which was slightly above the temperature for the maximum ammonia production. One of the questioners was apparently confused between gas-ovens and coke-ovens, when referring to gas being taken off for heating the ovens. With the gas-oven plant, the ovens were heated entirely by producer gas. In one of the lantern-slides there was shown an installation arranged with two collecting mains—one for lighting gas and the other for gas for heating the ovens; but this was for coke-oven plants, when it was desired to use a portion of the gas for town purposes. With a coke-oven plant, approximately 50 per cent. of the gas produced from the coal was required for heating the ovens. Therefore there was 50 per cent. for other purposes; and when this was used in the town, the two mains referred to were employed. There would be a pressure, if they were as particular in the case of a coke-oven plant as with a gas-plant; but in order that there might be no pressure, they let the gas get away. There was only one ascension-pipe. With regard to the life of the ovens, this might be anything, according to the quality of the coal which was being carbonized, and the method of operating. Naturally, if they were going to operate for a maximum production of gas, they would work at a higher temperature, which would tend to shorten the life of the oven. But the most important factors were the cleaning of the producer gas and the amount of salt contained in the coal. He did not know what was the experience of the members with regard to the effect of salt in a coal on fire-bricks; but in connection with coke-ovens it was a very serious matter indeed. An abnormal percentage of sodium potassium salts had a highly destructive effect on the brickwork. The salt could be very largely removed by efficient washing; but in coke-oven plants the washing was not always carried out as it should be. The salt content might bring the life down to twelve or eighteen months. His firm had erected a number of coke-ovens in which not a brick had been replaced for five years; but three to four years was quite an average period before any repair was needed, and then generally it was only a matter of replacing a few bricks in the oven walls. The life of the plant itself, apart from the renewal of the walls, was almost indefinite. Plants in operation to-day had been working twenty-five years. Of course, they had had the linings of the ovens renewed from time to time. With reference to the production of gas during the charge, for one oven there would be a moderate variation; but as they did not advocate their system for less than twenty-five ovens, the variation in each individual oven was quite balanced—though, as he had said, when working on twenty-four hour carbonization there was some slackening off in gas production, and in calorific value and illuminating power, towards the end of the charge. But it had to be remembered that the gas was not going straight from the ovens to be burnt, particularly between midnight and six o'clock in the morning; and any variation there was, would be sufficiently balanced by the production of the rich gas at other times. There had been absolutely no complaint or trouble in any way as far as even quality was concerned at Buda-Pesth working on twenty-four hour carbonization. The gas was run into one holder and out of another in the usual way. The candle power was not tested; but the calorific value was recorded continuously in two or three places, and quite an even line was shown. Carbonizing costs were very much lower than with either vertical or horizontal retorts; and it must be borne in mind that ordinary gas-works coke could be produced. They were not absolutely tied down to metallurgical coke. Plants—like the one at Birmingham—could be arranged for either pressed or unpressed coal; so that ordinary soft coke or metallurgical coke could be produced at will. Naphthalene was always very low. In one plant he knew of, the naphthalene was reduced almost exactly 100 per cent. by chamber ovens as compared with horizontal retorts. The proportions of ammonia recovered in the saturator and in the liquor varied, of course, very considerably—principally according to the class of coal being used. Taking the usual figures, of (say) a typical Yorkshire coal, giving 1·5 per cent. sulphate of ammonia, probably 1·1 or 1·2 per cent. was free ammonia and the remainder fixed ammonia recovered in the liquor. It was not necessary to provide a separate sulphate of ammonia plant to deal with the liquor. It was passed into a small still; and then the ammonia evolved in the still was led into the main stream of gas passing through, and went with it into the saturator—in a way enriching the stream of gas in ammonia. Lime was used in the still. Of course, the carbonizing system with which he had been dealing was primarily intended for large gas-works. Small gas-works, with units of 10 tons, would be in a hopeless fix. If less than twenty-five ovens were installed, there was the same machinery to be provided, and full efficiency would not be obtained from it. One or two small installations had been put in by his firm. At Innsbruck they had put down ovens of about 6 tons capacity; but generally small ovens were not advocated. Lower working costs and higher efficiency were the experience with large units. As to the capital cost of chamber ovens, this, of course, was rather higher than for either horizontal or vertical retorts; and it had been put forward as one of the principal objections to chamber carbonization. They found in England, both on gas-works and coke-oven plants, primary capital outlay seemed to be regarded as the deciding factor. On the Continent, this was not the case. The capital cost was important; but other things also were taken into consideration. If they took (say) ten years of actual working results, chamber carbonization would compare with any known system of retorts; but it was necessary for all the factors to be taken into account. A dry main was used, controlled by a valve. There was no water or liquor seal; but the main was flushed with hot tar or liquor, so as to prevent any deposits of pitch.

Mr. SCEARS, in proposing a hearty vote of thanks to the lecturer, said Mr. Cooper had been at some personal inconvenience, apart from the distance he had travelled, in being with them that evening. They had seen from what had been told them that there were many things in coke-oven practice which suggested improvements that might be made in gas-works practice. The ammonia recovery plant was extremely interesting; and this was a direction in which apparently greater efficiency might be obtained by gas people.

Mr. F. PEARCE (North Middlesex Gas Company), in seconding, remarked that though to them in the South the circumstances which would render desirable the installation of chamber-oven plant would be exceptional, still they ought to know something about the subject.

Mr. COOPER, in acknowledgment, said it had been a great pleasure to him to give his lecture, because he knew the subject was one which was attracting much attention from gas engineers, and it was worthy of this attention. Coke-oven practice had developed along scientific lines to a very large extent in the last twenty-five years; and there were points about it which it would be greatly to the advantage of gas engineers to take up.

INSTITUTION OF MECHANICAL ENGINEERS.

At the Annual Meeting last Friday, the Council presented their report on the work of this Institution during the past year. It showed that the total membership at the close of 1912 was 6160; and that 550 additions were made to the roll during the twelve months. As, however, the deductions were 364, the net increase was 186; bringing up the total to 6346. It was mentioned that His Majesty the King had conferred the honour of Knighthood upon Mr. Corbet Woodall, D.Sc., who was admitted a member of the Institution in 1882.

Among the papers read at the monthly meetings was one on "A New Method of Cooling Gas-Engines," by Professor Bertram Hopkinson, F.R.S., a member of the Institution. This paper was noticed in the "JOURNAL" for the 5th of August last (p. 372). The first "Thomas Hawksley" Lecture was delivered at the Institution on the 5th of December, by Mr. Edward B. Ellington, a Past-President, who took for his subject "Water as a Mechanical Agent." In view of the numerous applications for the delivery of the lecture in different centres, arrangements were made for it to be repeated in Birmingham, Leeds, and Liverpool, as well as in Calcutta. The interest taken in this first lecture, and the decision of the Council to have the lectures repeated in the Provinces when so wished by a sufficient number of members, led Mr. Charles Hawksley, a Member of the Council of the Institution, to double his gift of £1000 (with interest) to commemorate the centenary, on July 12, 1907, of the birth of his father, Mr. Thomas Hawksley, who was a Past-President. The Council gratefully accepted this further offer, hoping thus to be enabled not only to carry on the sequence of these lectures, but to meet the views expressed by Mr. Charles Hawksley in 1907, by creating a "Thomas Hawksley" premium in connection with the Institution, and also possibly by adding a medal.

The graduates continued their monthly meetings during the session 1912-13. Among the papers read and discussed was one on "Coal-Gas Manufacture." by Mr. A. L. Evans, of the Woolwich Arsenal Gas-Works [noticed in the "JOURNAL" for the 22nd of April, p. 265]. The meeting in May was occupied by a discussion on "Gas *versus* Electricity for Lighting," introduced respectively by Mr. Evans and Mr. W. P. F. Fanghaenal. Eight visits were paid to works in and around London; the average attendance being eighteen, and thirty at the meetings. Among the prizes awarded for the best papers was one to Mr. A. L. Evans.

Accompanying the report were the accounts. The total revenue was £17,319, and the expenditure £13,632. Deducting entrance fees and life compositions, there was left a balance of £2975.

It is intended to hold the summer meeting in Paris towards the end of July.

An investigation carried out by Herr W. Herwig, of which an account is given in "Stahl und Eisen" [Vol. XXXIII., 1721], shows that the gas contained in blisters formed on steel plates during rolling and annealing consists chiefly of nitrogen. The gases evolved during the solidification of iron immediately after tapping from the blast-furnace include large quantities of hydrogen and carbon monoxide; white iron containing more hydrogen, and hot-blast grey iron more carbon monoxide. The nitrogen in steel turnings was reduced by heating in a current of hydrogen from 0·022 to 0·006 per cent.; and, though it was not increased by heating in a current of nitrogen, yet from a mixture of nitrogen and hydrogen in equal proportions a steel was obtained, in one case with as much as 0·052 per cent. of nitrogen. The author considered that similar action takes place in the converter. A steel containing 0·04 per cent. of nitrogen, when tested, broke without elongation, but was improved by prolonged annealing.

YORKSHIRE JUNIOR GAS ASSOCIATION.

PRESIDENTIAL ADDRESS.

Of Charles Roper, of Bradford.

The bulk of the members of Junior Associations have not much opportunity of describing new methods connected with the manufacture or distribution of gas; therefore, in asking your attention for a brief period, I will attempt to make interesting a very everyday subject, in the hope of demonstrating to my fellow juniors the possibilities of the ordinary round. I remember some years ago hearing a young man connected with the gas industry expressing his distaste for the ordinary routine work, and also his opinion of the uselessness of doing the same thing over and over again. But this called forth a rebuke from his chief "that it is the man who sticks to his work, no matter how often it is repeated, who in the end sees other ways and methods by which improvements can be made."

ADVANTAGES OF DUPLICATE MAINS.

One of the features of large manufacturing towns is the extent of the paved streets; and those who have had experience of the work and cost necessary when obliged to lay mains under such roadways, will, I think, agree that there is much to be said in favour of duplicate mains—that is, mains laid under the footpaths on both sides of the road—whenever there is the possibility of any revenue to be derived from them. Such duplication of mains also means much shorter service-pipes in the first instance, less trouble with renewals, and (most important) the restriction of the quantity of possible loss of gas through what has been described as the weakest part of the distributory system. In Bradford, for many years this question has been well dealt with. The introduction of tramways found old mains laid under the roadways in awkward positions; and these have been taken up and relaid under the footpaths wherever possible, with great advantage at the present time, when tramway-lines are laid in almost all the principal streets.

Owing to the development of heavy motor traffic, the main roads in all large towns are being made up very much stronger than formerly, with consequent increased cost of reinstatement. The cost of renewals of services is also greater when mains are laid under the roadway. Altogether things convince one that the initial capital expense of duplicate mains is worth all that it costs when it is necessary to provide for increased demands on the supply.

In my work, I have come across various instances of waste of time and money in tracing supplies in different parts of the district, especially so in the areas which have been added to the original gas area. These cases show how little care was taken by someone to record work done; and I am convinced that much can be accomplished by juniors to improve such a state of affairs. I have had the experience of seeking mains which did not exist (except in the mind of some old foreman), of laying a new main and finding afterwards a similar main alongside, as well as having mains recorded which prove to be 1-inch wrought-iron pipe laid through blocks of property. This kind of trouble is not confined to the smaller works, as I know of two undertakings with an output of about 100 millions which, until quite recently, had no records whatever of mains laid.

I therefore propose to describe the manner in which the work of the Distribution Department is carried on in Bradford, and hope that some may find an idea or two for their own use.

BRADFORD DISTRIBUTION DEPARTMENT.

The Bradford gas area is 29,500 acres in extent, and 10¼ miles in length and 9 miles in width; the main mileage being over 460, varying in sizes from 2 to 28 inches in diameter. The district is very hilly; and consequently there is great variation of levels, these ranging from 168 to 1200 feet above O.D. The centre of the city lies at a level of about 350 feet O.D.; and three of the principal works are situated within ¾ mile of the centre—the difference in the levels of the works being only about 55 feet. At these works a large proportion of the output is at present manufactured; and the governor pressure of about 20-10ths is soon increased by the rise in altitude. Special attention has therefore to be given to the type of wet meter fixed at the various levels.

For the highest levels, a wet meter is used which is provided with an extra long filling-tube which stands the pressure very well. The following examples may be of interest: Meter "A," 3-light wet, with stuffing-box and raised filling-tube, blows at the filling-tube at 83-10ths pressure. Meter "B," 3-light wet, with patent spindle tube and raised filling-tube, blows at the filling-tube at 67-10ths pressure. Meter "C," 3-light wet, with stuffing-box and low filling-tube, blows at the filling-tube at 50-10ths pressure.

The second largest works, at Laisterdyke, are situated at a level of 520 feet; and in addition to supplying the immediate district, they supply some of the higher portions of the city by means of a trunk main comprising 900 yards of 28-inch and 3100 yards of 24-inch, finishing at a level of about 550 feet. At this point a station-governor, housed in a small building, reduces the pressure down to 18-10ths. The district supply from this governor is isolated, and rises to a height of 940 feet. The general supply is on the arterial system, with the exception of the district just referred to, and three small low-lying portions, which have each an independent supply controlled by separate station-governors.

[The President here exhibited three charts, to give some idea of the variations of level on trunk lines of supply. The first chart showed the main supply from Valley Road works, 293-feet level through a large residential district to a point 1960 yards distant, and at an altitude of 547 feet, where the huge factories of Messrs. Lister and Co. make a heavy demand on the supply. This firm take about 20 millions per annum; and it is estimated that 70 per cent. is used in various manufacturing processes. A further distance of 1660 yards, rising to a height of 715 feet, goes through a rapidly increasing district, where the supply is augmented from the Thornton Road works. Some 2200 yards further, through a district at present undeveloped, after reaching an altitude of 832 feet, there is a rapid fall of 116 feet in about 800 yards to an outlying village, where this main is connected to the mains laid from the Clayton works, and thus provides an alternative supply. The second chart showed one of the leading mains from the Clayton works, where the levels vary from 590 to 900 feet, thence falling 320 feet in a distance of 2260 yards to the Wilsden holder station. Here a small exhauster draws about 6000 cubic feet per hour through the main, which, for the last 1300 yards, is not used for supplying consumers—a separate distributing main from the gasholder station being used for this purpose. The third chart showed another trunk supply from the Bradford works.]

In the district, there are two features of the general house property which are not very common, and which present a problem of supply. I refer to the back streets, and to the cellars or basements, which are almost universal here, except in the principal residential district and in some of the modern medium-sized property. As we only lay the service-pipe just into the building, the usual position of the meter is in the basement; and as one builder places these basements only to the front, and another builder puts them at the back, of the property, it is generally necessary to lay mains in the back street as well as in the front. These back streets are also lighted by public lamps; and therefore to supply both lamps and consumers we usually lay 3-inch mains, thus reducing the use of wrought-iron piping to the minimum. As these back streets are paved with stone setts sooner or later, the initial expense is preferable to costly renewals. There is one disadvantage in having these mains laid under the paved back street—viz., in the event of an escape from a broken main the gas often finds its way into the outbuildings, and sometimes into the property, along drain tracks, &c., before the escape is noticed—sometimes with rather awkward results.

RECORDING MAINLAYING WORK.

I will now describe the method in use in Bradford for recording mains laid; and, while not claiming that it is either original or better than other methods, must say that it works very well. Most of the older mains were laid in the footpaths in a regular position about 1½ feet from the edge of the kerb; but with the extension of the electricity supply and the multiplication of cable-tracks, an arrangement was come to between the two departments whereby we have for years laid our new mains in the inside half of the footpath; the cables being laid in the outer half. Since the trouble caused by fusion of mains years ago (referred to by Mr. Charles Wood in his Presidential Address to the Institution of Gas Engineers in 1906), we have also arranged to keep, for all new work, at least 12 inches between the mains and cables, whenever possible; and when this distance has unavoidably to be reduced, flagstones are placed between.

While mainlaying operations are in progress, the work is under direct superintendence; and at the close of the job the length is measured up, and all particulars of situation, &c., taken by the Mains Department staff. A sketch of each job is then made in the mains book (which forms a record of all mains laid), giving the situation of the property supplied, the street or main road from which the supply is taken, and the sizes of the original main and the new one—red ink denoting the former, and blue the latter—the date and particulars of the materials used, the name of the foreman in charge of the job, and the number of the plan on which the street is situated completing a useful record, which is initialled by the person making the entry. This book has an index bound in the front, in which each job is indexed for reference. The present book is lettered "M," in a series started some 28 years ago; so that the set comprises in itself a useful record of the mains for handy reference, apart from the actual plans.

From this book, the drawing office staff enter the job on to the plans; a survey of the property and street being made if necessary, as in the case of opening-up new building land—the plans thus being kept up to date. The book is then signed by the person entering the job, so that each sketch gives a full account of how the work is put through. From this book also particulars of sizes and lengths laid are entered into a journal for statistical purposes and into a plans book which records the mains shown on each individual plan.

I would like to emphasize the necessity for all who are in any way responsible for main-laying operations to endeavour to obtain information as to position and size of existing mains when connections or repairs are being made, as well as to take correct records of all new work. As Ordnance Survey maps of the 1-2500 scale (25·3 inches to the mile) can be obtained for all parts of the country at a reasonable figure, there is no excuse for slackness in this important branch of a gas undertaking's work, however small the concern. The extra cost can be, and is often, spent

many times over in fruitless searches, besides the worry and annoyance to other road users. In addition to the surveying of new streets already mentioned, the Surveyor's notices of street alterations and widenings are noted; and when such work is carried out, these jobs are surveyed and corrected on the plans—thus ensuring the correct position of the existing mains being given where the road is altered.

In order to avoid clashing with the work of other Corporation departments, we have for several years past held fortnightly meetings, which are attended by representatives from each department. At these meetings, advance notice is given of any proposed new work—such as street improvements, paving and flagging work, general repairs to roadways, &c., also new gas and water mains, and cable-tracks. These meetings have proved of considerable service, as it has often been advantageous to lay new mains prior to the various street works being carried out. In addition, the usual daily notices of breaking-up streets are carefully made to the road authorities. This item is well worth attention, particularly so when working in the area of another local authority, as charges for reinstatement can be checked more readily if all work is properly notified.

We have still in existence a set of plans of the mains which were apparently commenced about the year 1857, many of which plans were surveyed by local men before the Government surveys became extensive. These, however, were some 21 years ago superseded by a new set of Ordnance Survey maps, comprising 96 sheets of the town survey, scale 1-500 (10·56 feet to a mile), which cover an area of roughly 1¼ miles from the centre of the city, supplemented by 51 sheets of the parish plans, scale 1-2500, which cover the remainder of the area of supply. These plans were prepared from the old set, and have been followed up to date in the manner described. Another record of these plans was made some years ago, when the engineer had photographic reproductions made of each sheet, size 8 in. by 5½ in., which are bound up in album form. In the event of the destruction of the plans by fire, we have a record up to that time, which could be copied and brought up to date from the mains books.

A further set of plans was drawn out some twelve years ago, on which the trunk and feeding mains throughout the district are shown in graphic form. These graphic plans, as they are termed, are on uncoloured parish plans, six sheets covering the central area; while for the outer district county maps (6 inches to the mile) are used, mounted together to form large sheets. On these graphic plans the principal mains are shown by lines varying in thickness according to the capacity of the main; the scale ranging from 1-100 inch for the 6-inch main (which is the smallest size shown in the central area) to 47-100 inch for the 28-inch mains. This scale is based on the delivering capacity per 1000 yards of main, with 1-10th loss of pressure; the 6-inch main, with a capacity of 1880 cubic feet, being taken as the unit, and shown by a line 1-100 inch in thickness. The 8-inch main, with a capacity of 3880 feet, is shown by a line 2-100 inch; and so on. These graphic plans give a good idea of the supply, and when considering schemes of extension are much handier for reference than the ordinary plans, on which it would be necessary to follow the mains from sheet to sheet, and often from one scale to the other.

OUTSIDE VALVES.

During the last twelve years, outside valves have been fixed on all services of 1½ inches diameter and upwards; and the position of these in the street is indicated by small cast-iron plates fixed to the wall of the building directly opposite the valve. These plates are 7 inches diameter, and bear a figure representing in feet the distance from the building. Similar wall-plates are used to denote the position of syphon-pots; these being oval in shape, and having the letter "S" cast on, in addition to the number. A triangular plate denotes main valves which are used to separate the various districts when necessary. These, however, are few in number, and are chiefly used when the out-districts works are in operation, when it is sometimes desirable to isolate such districts from the general supply. An indexed record of these valves is kept, in which is set out the situation of the valve, the size of the main, the number of the plan on which it appears, and particulars of the district affected by its operation. Columns are provided to record (for each valve) its present position—*i.e.*, open or closed—with date and name of person responsible for its operation.

ATTENTION TO SYPHONS.

We have rather a large number of syphon-pots, owing to the variable level of the district; while the becks or streams which pass through the centre of the city are also responsible for quite a number on our principal mains. These becks, though underground, are very near the surface of the road, and have been the cause of some curious mainlaying to get trunk mains across them. In one particular instance, a trunk main of 28 inches diameter had to be divided, and taken across the beck between the girders carrying the roadway, by two smaller mains; the paving stones of the roadway being actually laid on the mains.

A card record of these syphons has recently been introduced, and is working very satisfactorily. Two sets of cards are used; the first being an index in simple alphabetical order. On each card is set out the name of the street, the position of the syphon, the size of the main, and its character—*i.e.*, whether on trunk main, district main, main end, service, &c. Columns are provided for the date, by whom cleared, and the number of buckets emptied from it. The principal syphons have cards of a different colour, with a separate index for easy reference.

The second set of cards gives the name of the street, position of the syphon, and approximately how often it should be cleared; while the columns are simply used for dating. These cards are not indexed like the first set, but are grouped in districts representing each day's journey; all the cards of a group being given a distinctive number, so as to ensure a card being put back in its proper place should it be at any time necessary to alter any group for a special journey. These cards are filed in a date-index, each day's work being thus shown in its place or date; while if any syphon is missed from a journey, or only taken every second or third journey in that district, its card is gradually worked forward in the file, and its position is easily located by its group number. The principal syphons have again cards of a different colour, and are provided with a tab, so that the position of these cards in the index is very noticeable, and there is less chance of one being overlooked. Each day's work is entered up on the respective index-cards; any serious variation of the contents of the syphon being readily observed. The second set are marked with the date only, thus providing a record as to when each particular group or district has been attended to.

MAINTAINING THE OUT-DISTRICT SUPPLY.

A description of the manner in which gas is supplied to out-districts of the city when the local works are shut down, may be of interest. When the boundaries of the city were last extended in 1899, the local authorities bargained for a gas supply at the Bradford rate; and to provide this, the undertakings of four gas companies who then supplied those districts were purchased by the Corporation. When the Corporation took over the works twelve years ago, trunk mains were laid from suitable points in the old system to each of them; exhausters driven by gas-engines drawing sufficient gas daily to fill the holders through these mains from the ordinary distributing system. In the case of three of the works, the levels of the area between them and the centre of the city vary considerably. For instance, there is the supply to the Eccleshill and Idle works. The level rises from 329 feet at the centre of the city to a height of 691 feet in a distance of 3575 yards. Up to this point the mains are used for ordinary distributing purposes; but a separate main carries the gas forward—the levels falling to 554 feet at the Eccleshill works (a distance of 1466 yards), and to 255 feet at the Idle works (a further distance of 2100 yards). There is very little trouble with these supplies; and in this case 40,000 cubic feet of gas per hour are drawn with an exhaust of 8 inches at the Idle works. Charts on the same main at the Eccleshill works show a draw of about 4 inches; while at Undercliffe (two miles away, and at 436 feet higher level) the general supply pressure is only reduced by about 1 inch.

To improve the control and distribution of the gas from the different works, we are at the present time fixing exhausting plant at the Mill Street works capable of dealing with 100,000 cubic feet per hour, by means of which it will be possible to transfer the gas from or to each of the four Bradford works as required. As our holding capacity is only about 10 million feet, divided up in twenty gasholders, and our maximum daily output is 11,865,000 cubic feet, this installation will when completed provide a much-needed relief in times of heavy demand, when gas can be drawn to these works for supplying the central portion of the area. The plant comprises a Waller exhauster of 100,000 cubic feet per hour capacity, steam driven, with inlet and outlet mains controlled by eight Donkin rack-and-worm valves; the whole being housed at the Mill Street works. Existing independent mains of 12 inches diameter are being connected-up to this plant; a new main to the Birkshall works having still to be laid.

DISCUSSION.

In the course of a discussion which followed,

Mr. SUTTON asked for Mr. Roper's experience of the use of governors. He wished to know whether the Corporation recommended consumers to use governors, or left it to them to take the initiative.

Mr. ROPER said the Corporation were not recommending governors at all. They came across governors in many parts of their district, but never found one which was working well.

Mr. SUTTON said if, upon going to deal with a complaint, they found that the governor had been bad, it was most probable that it could be put into use and overcome high pressure. Where there were pressures varying up to 6 inches, they could easily have a big gas bill, and a discontented consumer. He thought a governor was a good thing for pressures above 4 inches; and whether it was satisfactory or not was all a question of the type of governor that was used.

Mr. ROPER said the Corporation had had occasion, during the last twelve months, to devote particular attention to the causes of complaints; and they had found none was due to high pressure. When they went to deal with the complaint, they found governors all up and down the place that the people having them knew nothing about; and his advice was to take out the governors, because people would not go to the expense of keeping them in order.

Mr. SUTTON suggested that possibly, owing to the activity of salesmen, governors were often sold and fixed in places where they were not of real use. In some circumstances, it might be that a consumer, persuaded into purchasing a governor, found

after putting it in, that it reduced what had previously been a satisfactory pressure. Again, a governor which had been in use a long time might have been put in when gas was much richer than at present, and might have been quite effective at that time, and yet not be effective now. This might account for the discontent of the consumer.

Mr. J. DEMAIN asked if Mr. Roper had had any experience of steel mains.

Mr. ROPER said the Corporation had laid a large quantity of steel mains quite recently in the centre of the supply area; but up to the present there had been no supply given off these mains, so that he could not speak of results. They had used the expanding nipple connection; and they had found this quite sound, so far as their experience had gone.

Mr. P. M'NAB asked if, in the case of the 3-light wet meters blown at 83-10ths pressure, any records were taken as to the percentage of error, and if the lights were satisfactory.

Mr. ROPER replied that they had not taken any particular tests, and did not know that they had any wet meters really working at this pressure. He had only mentioned it to show that meters could be obtained that would work fairly well under those conditions.

Mr. M'NAB suggested that an effort should be made to get the percentage of error, because, with the number of meters that would be used in Bradford, this would make some appreciable difference in the gas unaccounted for.

Mr. SUTTON said that if they got anywhere near the pressure of 83-10ths which had been spoken about, he should think the Corporation would inform the gas consumers that governors were necessary.

Mr. ROPER said the highest pressure that they would have anywhere in the district would be something short of 6 inches. There were two districts where the pressure was regularly above 5 inches, but none where it nearly approached 6 inches. So there was a good margin between the highest Bradford pressures and the 83-10ths. Many more dry meters than wet meters were being sent out; and in course of time the wet meters on the higher levels would be entirely eliminated. In answer to another questioner, he stated that the Corporation had a Mansfield's wireless pipe locator. It was in the hands of Mr. Wood, and he (Mr. Roper) did not know what use had been made of it.

A MEMBER asked whether the flagstones put between the gas-mains and the electric cables to prevent electrolysis would not actually form good conductors of electricity, instead of the opposite, because of the quantity of moisture they would in the ordinary course of things absorb.

Mr. ROPER said he had not looked at the matter from this point of view. All he could say was that there had been no cases of electrical fusion, so far as he knew, where the flagstones had been put between.

Mr. HILL asked what age the oldest of the Bradford mains would be, and whether there was a system of periodically relaying them.

Mr. ROPER replied that there would be some mains sixty years of age or more; but some had been relaid which had not had anything like such a life. There was no exact system of the periodical relaying of the mains.

Mr. CLEGG asked what kind of material was used in jointing the Bradford mains, and what Mr. Roper's opinion was of the relative value of run lead and lead wool; and whether anything could be done in this respect in regard to electrolysis.

Mr. ROPER said that for ordinary cast-iron pipe work run lead had been used practically all the time, though a little lead wool had been employed for repairs, connecting-up, and such like. In the steel mains, lead wool was used entirely; and so far as he knew it had given every satisfaction. But it required a lot more work putting into it than was put in by the average individual. He had tested the joints of the steel mains, and found that the pressures which the lead wool would stand were remarkable. The percentage of failures was very small indeed.

Mr. HILL asked if there was any system in Bradford whereby the hourly output during the twenty-four hours from all the works together could be ascertained, so that they would know how it fluctuated.

Mr. ROPER replied that they had never taken the output for single hours, unless it might be in some time of exceptionally heavy demand, and for a temporary purpose. But the stocks of gas were taken at different periods of the day, and were all entered up at the office, so that the output was obtained for the twenty-four hours, and for the daytime hours, 8 to 4 o'clock.

Mr. SUTTON asked if any one present had had any experience of welding steel mains.

Mr. DEMAIN said that, so far as he could gather, the dangers of the welding were great as well as the advantages; and very much depended on the quality of the men and the stuff used. He had heard of a length of main in which 25 per cent. of the joints were found to be leaking; but the leakage was in the wall of the pipe—whether owing to the fault of the material or the clumsiness of the men, he did not know. He was given to understand, also, that the cost was excessive—two or three times the cost of the lead-wool joint. As, when they laid a main, they expected it to be covered for thirty or forty years, they had to be very careful, and could not afford to put in any kind of joint unless absolutely sure that it was the right thing.

A cordial vote of thanks was accorded to Mr. Roper, on the motion of Mr. WALKER ATLEY, seconded by Mr. HILL.

LIGHTING OF PICTURE GALLERIES AND STUDIOS.

The lighting of picture galleries and studios was the subject discussed at the meeting of the Illuminating Engineering Society last Tuesday evening, at the Royal Society of Arts. The President of the Society (Professor SILVANUS P. THOMPSON, D.Sc., F.R.S.) introduced the subject; and he did so before an audience of which artists composed a very fair proportion. In treating of his subject, Professor Thompson presumed that the surfaces to be lighted in an art gallery were vertical ones against which pictures were hung. Works of art were also frequently placed on horizontal surfaces, and there was statuary to be illuminated. Those who, in days long since, remembered the room in which they were assembled knew how imperfect was the old-style gas lighting; but the pictures then looked much better than they did under the present electric light, because the gas-lights were in a superior position for the purpose of illuminating them.

It is necessary to indicate what the Professor had to say about daylight illumination. He laid down as a general principle that there ought to be a superabundance of opening for the light of the sky to come in; seeing that, by the aid of screens, the amount of light could always be diminished. Side lighting was generally disastrous to some aspect of the place. He had never seen a satisfactory art gallery in which the height of the openings gave a slope of light lower than 45°. The lowest part of the opening ought to be at least 45° above the level of the picture, so as to avoid the reflection found when the light came in at too low a level. It was also a matter of importance as to what was done with the rest of the wall between the top of the pictures and the places where the rays of light came in. This space should be properly occupied. If the wall space was improperly occupied, then the pictures opposite did not receive the proper amount of light. He criticized the strong crimson tone of the walls in the Turner room at the Tate Gallery, which walls had, at certain times, a bad effect on the tints in the pictures.

What was the right position in picture galleries for the inlet of daylight was the right position for the artificial light. For what purpose did they want the artificial light? Was it to give a general illumination over the walls of the room, or to light up the pictures? Obviously, the arrangement of lamps which might be good for general lighting in a room was not that which would be adopted for lighting special pictures. One rule was that lamps should be so screened that they did not get reflection on the glass or covering of the pictures coming direct into the eyes when standing in the best position to see the pictures. Of course, one way to get rid of this would be to have indirect lighting—to cause the lamps themselves to throw a light upon the ceiling or a screen which would diffuse the light. This produced a general illumination. It was quite a common thing to have ceiling lights. This was satisfactory from one point of view. For an engineering drawing-office it was perfectly admirable to throw the light up against a white surface above, and let the white surface diffuse a general light on the board so that there were no shadows. But for art galleries, there seemed to be something wanting, if there was only indirect lighting. For sculpture galleries where a good deal of the beauty of the sculpture depended on the shadows, a shadowless light was not required; but they wanted a light that would give them shadows, more or less. He laid this down as a challengeable proposition: That, in regard to the position of lamps in picture galleries or studios, they ought to be placed so that the main direction of the light they gave was the same as the main direction of the light that came in through the windows (assuming them to be properly placed) by day. One saw this in certain cases. At the Royal Scottish Academy, the artificial lighting was by groups of lamps put all round, and across the space of, the skylight, so that the direction of the light was the same by night as by day. He could not too strongly emphasize the point that the artificial lighting should be from the same direction as the natural lighting.

It had been urged as an objection to artificial lighting that the colour was different from that of the morning sky. If they succeeded in matching the morning sky with artificial lights, they would not match the afternoon sky. It was, however, possible to do something in the way of approaching daylight with artificial light—as with gas-lamps, by hanging in front of the lamps screens of coloured glass or tissue paper or silk; but there had always been considerable hesitation on the part of those who were most concerned in this matter in making use of adventitious aids of this kind. There was a good deal of trouble in managing screens; and if glass was used it became brittle. With the old arc lamp the light was whiter than with gas-lamps; but by screens of various kinds of material, the light could well be toned-down or subdued.

Much had, of course, been done of late years in the matching of colours. In Bradford, for instance, a great deal of attention had been given to this question. Professor Gardiner, of the Technical School in Bradford, with other authorities, had made many experiments to try to find the kind of screen which would give them a light by which they could match the colours of fabrics. Professor Gardiner told him that he had used arc lamps with a blue glass shade having both cobalt and copper in its composition, and such shades were now being used considerably in the factories of Bradford and Huddersfield. In Germany, a lamp had been brought out giving practically a white light; but it had been done in quite a different way. They began with an arc lamp surrounded by a

lantern glazed with a curious mosaic of coloured glass, in which blue was prevalent. Outside was a glass diffusing screen, which mixed up the mosaic, and gave a diffused white light. For some years Mr. Mackinney had been at work making lamps with screens, carefully selecting the particular coloured glass, for matching. Then special forms of arc lamps had been made to work with long arcs, so that the flame part between the tips of the carbons was unusually long; the light coming from the lamp consisting of light sent out by the white-hot carbon. In these particular lamps the blue of the arc was more in excess than in the case of other lamps; so that the light of this particular arc lamp closely approached daylight. One of the very worst lights for the purpose of creating daylight was the horrible green light used for advertising tube stations. Nothing more ghastly from the colour point of view could be imagined. Another source of light not to be recommended without screens was the gas-mantle, unless carefully selected, because they were of a greenish tint. But he did not condemn the incandescent mantle without it had a greenish tint. Quite recently there had been a number of attempts—and he claimed for them a distinct success—to imitate daylight by having incandescent tungsten filaments inserted in a blown bluish globe, so that the lamps could be put into the ordinary socket without any complication in the nature of a screen. Though this was a distinct step in advance, there remained much to be done, owing to the extreme complexity of the colour question. Greens were the worst colours to match; and if they could match greens satisfactorily, they would have attained a real daylight lamp.

The discussion did not lead very much further towards the solution of the problems involved. A few words from the Chairman (Mr. F. W. Goodenough) opened the discussion. Incidentally, he mentioned that Professor Thompson had for some time desired to be relieved of the presidency of the Society; and they had had at last, very reluctantly, to accept his desire as final. He had been their President from the inauguration of the Society. Sir William Bennett, one of the King's surgeons, had intimated his willingness to accept the presidency; and he would succeed Professor Thompson on his retirement next May. Then Mr. A. P. Trotter expressed the opinion that the lighting of picture galleries was largely a question of the proportions of the rooms—in fact, as much as the actual positions and areas of the windows, and the positions of the lights. He thought the matter was one for study by a Committee, just as the lighting of schools and libraries had been. He agreed that, if the lighting by the windows of a picture gallery was good, then by all means let the lamps do their lighting from the same direction. In some cases, however, the windows were badly placed; and the artificial lights could be better arranged to give a better effect upon the pictures than the windows. Professor Thompson had raised the point that the north light was not a constant one. It was obvious that if one had a perfectly bright, clear blue sky, the light received from the windows was blue, and not white. This was not recognized until white clouds drifted by. The speaker then showed an apparatus which he had made with the idea of getting a screen which would absorb the necessary amount of superfluous yellow and red rays resulting from artificial lights. He also exhibited a luminosity curve constructed from Abney's work, which showed that, in some forms of light, there was a large amount of yellow light to be absorbed in order to produce anything like daylight. With the apparatus he had devised, he had tried various makes of glass. He hoped that some one would invent suitable sheets of glass, so that they could be used before existing lights to attain the desired end. A communication had been received from an American correspondent (Mr. Luckiesh); and Mr. J. S. Dow gave a summary of it. It was held that in a big picture gallery each picture should be illuminated by itself; and a study should be made of the inclination at which the rays struck the picture so as to accentuate its features.

The artists had their say. Mr. David Murray agreed as to the importance of the subject; but he thought that the blue globed lamp gave a fictitious duty to the colours. Mr. Joseph Pennell did not think there was the slightest relationship between the lighting of a studio and the lighting of a picture gallery. The studio was a place to work in; the picture gallery a place in which they desired to see things as well as they could. He did not believe any artist liked the good old north light, about which so much was heard. Professor Thompson said an arc lamp had been devised which would prolong daylight; he (Mr. Pennell) thought it absolutely impossible to do anything of the sort. They could not convert artificial light to daylight. In regard to the lighting of picture galleries, he considered that the proper system was a vertical screen (which could be raised and lowered according to varying requirements), with the lights behind it. Mr. V. H. Mackinney told how he had been at work for a long time upon the problem of how to give a definite uniform illumination over a surface; and he demonstrated by a picture how well he had succeeded. Mr. Percy Bigland stated that in the lighting of picture galleries he found that metal reflectors were of no use. He had tried a great number in his own studio; and he found that none of them gave such a good result as when he took some canvas and whitened it, and used it as a reflector. Mr. Murray asked to be allowed to say, in reference to Professor Thompson's remarks about green colours, that painters found with artificial light that yellows and violets were more trying than greens. Mr. Thornton advocated the individual lighting of pictures. Mr. Bush held that cornice lighting was a mistake in picture galleries, and considered that indirect lighting behind the observer was far better. Mr. T. E. Ritchie pointed out that, in using coloured glass screens, there was a great loss in light—it might be 50 to even 80 per cent. This was important in the lighting of such large areas as art galleries.

In his reply, Professor Thompson said he was very interested in hearing from Mr. David Murray that yellows and violets were more difficult colours to work with than greens. If they examined the spectrum from red to yellow, they could more readily detect the slightest change in the yellow part of the spectrum than in any other part. He found the greens perplexingly complex in their spectra. Mr. Mackinney had really not done justice to himself. He had, with great patience and perseverance, devised by geometrical treatment a system whereby he got a uniform light from top to bottom of the picture.

COKE-OVEN GAS FOR LIGHTING.

A bye-product coking installation which supplies with lighting gas a Westphalian town of nearly 146,000 inhabitants, was described by Mr. L. D. Ford in a paper that he read recently before the North of England Institute of Mining and Mechanical Engineers. The plant is a modern one—having been erected in 1909—and it includes the Otto "direct" process for the recovery of ammonia in the form of sulphate.

There are, he said, two batteries of fifty ovens each of the Otto-Hilgenstock under-burning regenerative type; and for heating them the gas from the bye-products plant is conveyed through a central main running underneath the entire battery. The yield of gas may be reckoned as 11,300 cubic feet per ton of dry coke, or some 5,651,000 cubic feet per 24 hours; and of this 50 per cent. is burned under the coke-ovens, the surplus being divided in the following rough proportion: Illuminating gas, 12 to 20 per cent.; power gas, 12 to 18 per cent.; and gas for the heating of boilers, 15 to 25 per cent. These figures vary considerably, according to requirements.

As to the town gas, this is supplied from one battery only; and in order to ensure good gas of constant and suitable quality, it is arranged that when an oven has been filled it is first coupled to the works gas collecting-main, which takes the products of distillation until the end of the second or third hour, after which the gas is switched over into the town gas collecting-main, which draws the gas until the end of the twenty-second or twenty-third hour, when the gas is again taken by the works gas collecting-main until the coking is complete. The gas from the second battery is used entirely for working purposes—that is, for the bye-product plant—for burning under the ovens and in the boilers, and for driving gas-engines. It needs only one collecting-main. The town gas and works gas are thus entirely separate, and require separate apparatus. The town gas passes from the coke-ovens into the collecting-main, and there the temperature drops to about 356° to 392° Fahr. It then passes along a 20-inch main to the tar-separator, on reaching which it has an average temperature of 185° Fahr. The separator is simply a horizontal cylinder or receiver, into which the gas enters through one or more inlets, as required, terminating in a spray-nozzle; a small pipe being inserted in the neck of each inlet, through which pipe cool tar is pumped. The gas, on meeting the tar-spray, the temperature of which is about 158°, is intimately mixed with the spray; and, owing to the frictional action on the tar-particles held in suspension by the gas, together with the reduction in temperature, all the tar, and also a certain amount of ammoniacal liquor, is extracted and falls down into the collecting-receiver below. From the receiver one part of the tar-fluid—the surplus tar—runs off through an overflow into a seal-pot, and so into the main separating tank for the tar and ammoniacal liquor; the remainder being again put into circulation by a small belt-driven centrifugal pump. In the pressure-pipe from this pump, a horizontal water-jacketed tubular cooler is inserted, which serves to regulate and keep constant the temperature of the spray.

On leaving the tar-separator, the gas, with a temperature of about 165° Fahr., passes through a superheater, consisting of a small spiral steel tube, placed inside the main, through which dry steam is blown; the effect being to raise the temperature of the gas in the main to from 185° to 203°. Leaving the superheater the gas, with its occluded water and ammonia vapour, passes directly into a totally closed saturator, half filled with dilute sulphuric acid, at a temperature of about 180° Fahr., with which the ammonia combines, forming ammonium sulphate. The gas, after leaving the saturator, passes through a small chamber, in which are arranged a series of baffle-plates; their purpose being to extract from the gas any liquor that might otherwise be carried away. The condensed liquor falls back into the saturator, and the gas, with a temperature of about 183°, is then passed through two water-coolers, which reduce the temperature to 86°. The light tar oil, naphthalene, and water condensed in the coolers are drawn off through seal-pots at the bottom of each cooler, and go direct to a special separator.

After quitting the coolers, the gas is drawn through a naphthalene washer; and it then passes through the exhauster, and is forced through a Pelouze and Audouin tar-extractor. Thence it goes to the purifiers. From there the gas, in a fit state for town use, passes into a small holder, from which it goes to the station meter, and then to the town gasholders—a distance of 3½ miles.

DISTILLATION OF COAL IN A VACUUM.

This subject has been dealt with by Messrs. Maurice J. Burgess and R. Vernon Wheeler in a paper submitted to the Chemical Society, and contained in a recent number of the Society's "Journal." It has been separately printed, and from the copy forwarded to us, the following extracts have been made.

In the course of an investigation into the nature of coal, the effect has been tried of distillation at different temperatures and under different conditions. Some account of the results obtained has already been communicated to the Society. In the earlier stages of this investigation, during the year 1909, distillations of coal were made at low temperatures in a high vacuum; the main object being to examine the liquid products. The gaseous products of distillation in a vacuum were also studied, and the results obtained form the subject of the present paper.

It has already been shown that as the temperature of distillation of coal is increased from 500° to 1100° the percentage of hydrogen in the gases evolved increases, while those of methane and ethane decrease; a decomposition-point, marked by a rapid evolution of hydrogen, occurring at about 750°. Below 450° it was stated that "ethane, propane, and probably higher members of the paraffin series, form a large percentage of the gases evolved."

When coal that has been finely pulverized and thoroughly dried in air at 107° is exhausted at room temperature, "occluded" gases in small quantity can be pumped off. These gases, unlike the occluded gases that can be obtained (sometimes in large volume) from newly-won undried coal, consist largely of carbon dioxide and carbon monoxide.

On raising the temperature of the coal during exhaustion, the succession of events is as follows: Occluded or "condensed" gases (unextractable at atmospheric temperature) continue to be removed in small quantity up to 150° or 200°. These gases are mainly the paraffin hydrocarbons, the higher members predominating. At about 200° there is a copious evolution of water (small quantities of gas being also evolved), and water continues to make its appearance at successive stages in the distillation up to 450°—the highest temperature employed in this series of experiments. This water, as has been pointed out in a previous paper, must be water of constitution. The gases evolved during the period of most rapid formation of water contain a high percentage of the oxides of carbon.

Between 200° and 300° decomposition occurs of some sulphur containing organic compound, for the gases evolved during this period contain a considerable proportion of hydrogen sulphide and tarnish mercury. This decomposition, which begins at about 270°, is practically completed at 300°. Simultaneously with the hydrogen sulphide, the gases contain a considerable proportion of the higher olefines, the evolution of which does not, however, cease or fall off until a temperature of 350° is reached.

Liquids other than water begin to distil at about 310°, at which temperature a thin reddish-brown oil appears. There is no marked evolution of gas at this temperature; and it seems probable that the oil is not necessarily a product of decomposition, but may be liquidated out of the coal conglomerate.

A decomposition point occurs at about 350°; there being then a rapid evolution of gas and much viscid oil formed. Decomposition then continues with increasing rapidity as the temperature is raised.

The mixtures of gases evolved at the different temperatures are very complicated, containing as they do hydrogen sulphide, carbon dioxide, ethylene and the higher olefines, carbon monoxide, hydrogen, and the paraffin hydrocarbons up to and including pentane.

The presence or absence of benzene vapour could not be definitely established owing to the difficulty there is in estimating it separately from the higher olefines. But neither benzene nor its homologues could be detected in the liquid products of distillation in a vacuum up to 450°; so that the presence of the vapours among the gaseous products is extremely doubtful.

Of the paraffin hydrocarbons, besides methane and ethane, propane and butane were isolated by fractionation with liquid air and solid carbon dioxide dissolved in ether, and the presence of pentane established by explosion analysis.

The higher paraffins mostly appear at the lower temperatures of distillation; the range 100° to 300° being attended by the greatest percentage evolution. Above 350°, the decomposition point of part of the coal substance, the percentage of methane increases, and that of the higher hydrocarbons decreases.

It is conceivable that the paraffin hydrocarbons obtained by exhaustion from coal at temperatures between 200° and 300°—that is, below the decomposition-point observed—are present as such in the coal; being held in a manner similar to, but more forcible than, "occluded" methane at the lower temperatures. The fact that there is a simultaneous evolution of olefines, however, makes it more probable that both classes of hydrocarbons arise from the thermal decomposition of solid paraffin or similar long-chain compound.

Results of Experiments.

One or two typical experiments only of the many that have been carried out need be recorded. Several different varieties of bituminous coal have been used, but no important differences have been observed in their behaviour on heating or in the products, whether gaseous or liquid, of their decomposition. The composition of the occluded gases, it is true, varies with the kind of coal and with its previous history—for example, with the length of time since it was mined; but a study of the occluded gases is but an incidental part of this research, and has, moreover, already received the attention of numerous investigators.

The first experiment to be described was made with a sample of Silkstone (bituminous) coal in the form of fine dust, obtained by pulverizing about 50 kilos. of washed "nuts," and had been passed through a 240-mesh sieve. The dust was not dried before use, and gave off a considerable volume of occluded gases on exhaustion at atmospheric temperature. When these gases had been removed, the coal was heated to 100°, exhaustion being continued.

Gases Evolved at 100°

The volume of gases evolved at 100° amounted to 34 c.c. per 100 grammes of coal, measured at normal temperature and pressure. Their composition was as follows:

	Per Cent.
CO_2	6·70
O_2	1·65
C_2H_4	0·85
C_nH_{n2} $(n > 2)$	1·30
CO	1·40
H_2	1·90
C_nH_{2n+2}	84·55

Gases Evolved at 200°.

At 200°, 65·5 c.c. per 100 grammes of coal were collected. A complete analysis was made of a portion of this gas, and the remainder passed into a condensing apparatus surrounded by a solution of solid carbon dioxide in ether, whereby a temperature of about −80° was obtained. Part of the gases (about 7·5 per cent. of the total volume evolved from the coal at 200°) liquefied at this temperature. The analysis of the total gas evolved was:

	Per Cent.
CO_2	8·85
O_2	0·70
C_2H_4	0 85
C_nH_{2n}	2·90
CO	2·60
H_2	2·75
C_nH_{2n+2}	81·00

Gases Evolved at 300°.

The temperature of the coal was now gradually raised to 300°. There was no further evolution of gas until a temperature of about 270° was reached; the gases then evolved tarnishing badly the mercury over which they were collected.

Heating and exhaustion were continued during two days; the temperature being maintained at 300°. Towards the end of the heating, the gases evolved ceased to tarnish mercury. Altogether, 58·5 c.c. per 100 grammes of coal were collected.

Butane was isolated from the gases by liquefaction, as in the case of the gases evolved at 200°. The analysis of the total gas evolved showed:

	Per Cent.
CO_2 and H_2S	35·35
C_2H_2	0·55
C_2H_4	1·05
C_nH_{2n}	18·85
CO	10·50
H_2	13·35
C_nH_{2n+2}	18·85

Decomposition of some part of the coal substance had obviously taken place between 270° and 300°; for, although the volume of gases evolved was not large, their composition was very different from that of the gases evolved below 200°.

Gases Evolved at 350° and at 400°.

On raising the temperature of the coal above 300°, a rapid evolution of gas took place between 320° and 350°; and, after maintaining the temperature during eight days at 350°, 985 c.c. of gas per 100 grammes of coal were collected. The temperature of the coal was then gradually raised to 400°, and exhaustion continued at this temperature during sixteen days. Four litres (0·14 cubic foot) of gas per 100 grammes of coal were collected. The analyses of the gases collected were:

	At 350° Per Cent.		At 400° Per Cent.
H_2S	1·70	..	0·70
CO_2	20·95	..	2 85
C_2H_2	0·15	..	trace
C_2H_4	1·90	..	2·35
C_nH_{2n}	17·90	..	6·15
CO	3·40	..	3·40
H_2	15·35	..	36·90
C_nH_{2n+2}	37·22	..	46·55

The paper concludes with some details of an experiment, typical of those in which fractionation by liquid air was resorted to, made with the Silkstone coal in the form of dust which passed a 100-mesh and remained in a 150-mesh sieve. The dust was dried at 107° in air before being put into the retort.

Under the presidency of Mr. P. Thomas, the South-West of England Association of Gas Engineers will hold their seventh annual meeting to-morrow (Wednesday) at Taunton. A report by the Secretary (Mr. H. D. Lumb) will be presented, officers and new members elected, and subsequently general business—including the "Question Box"—will be transacted.

FIRE RISKS OF ARTIFICIAL LIGHTING.

In "Electricity Supply Memoranda" in the "JOURNAL" last week, some reference was made to a paper read by Mr. Louis T. Healy, of the Royal Insurance Company, London, in which he dealt with the fire risks attending artificial lighting. When commenting upon the paper, we had not the full text before us. This was given in the "Post Magazine and Insurance Monitor" for the 17th ult., and a copy has been sent to us by the author. It will be seen from the following extracts that Mr. Healy touched upon some of the fire risks of other illuminants than coal gas, including electricity.

In his introductory remarks, the author said he would not attempt to be historical, but would merely review briefly the different methods of artificial lighting in use, including candles, vegetable and fish oil lamps, paraffin lamps, coal gas, oil gas, acetylene gas, petrol, benzol, petrol vapour, alcohol, and electricity. His remarks on some of these subjects were as follows.

CANDLES.

As to candles, it is hardly necessary, I think, to enlarge upon them. You all know the inherent risks—the candle which upsets, the candle which softens during a summer's night, bends over and sets the table on fire, and the candle whose flame sets fire to textile material.

Although the use of candles for general lighting has much diminished, they are still responsible for many serious fires. In the hands of workmen operating in roof spaces and like situations, they constantly prove themselves strong elements of danger; and it would be well if architects and consulting engineers, in their specifications, forbade the use of candles in such circumstances. Good and cheap electric torches are now easily obtainable. They would be better to work by and would be perfectly safe.

PARAFFIN LAMPS.

The properties of the ordinary paraffin lamp are too well known to warrant a long description of them. The oil generally used is petroleum, with a flash-point of 73° Fahr.; and the lamps are either portable, hanging, or fixed in brackets, and have glass or metal reservoirs. There is an air space above the surface of the oil in the reservoir. It is here that the vapour is formed which is the cause of lamp explosions; and it is important to remember that the higher the flash-point of the oil the smaller will be the amount of vaporization. The safest oil for the lamps is that which flashes at about 100° Fahr. Lamps should be kept scrupulously clean, and they should be well made and have properly fitting wicks. The lamp with badly-fitting wick is, I think, the one most likely to explode. Besides the ordinary paraffin lamp, there are other systems. One is that in which the oil is in a separate reservoir, and is conveyed to the lamps by means of pipes. Typical systems of this kind are the Kitson or "Empire" light, and the Blanchard light. In another system—the Blanchard "Handy" light—the oil reservoir forms part of, and is situated immediately over, each lamp.

COAL GAS.

Lighting by means of coal gas, which as a matter of fact generally consists of coal gas and carburetted water gas, has in recent years undergone many important developments. The ordinary flat-flame burner, together with the argand burner, seemed likely to be superseded by other forms of lighting, especially electricity, when the incandescent mantle became a commercial success, causing a great revival of the popularity of gas for artificial lighting. At first the vertical burner and mantle were adopted; but these have been almost universally replaced by the inverted type, with flame playing upon a mantle underneath the burner.

One important feature in connection with incandescent gas lighting is the use of the bye-pass burner for lighting-up. There is in use in conjunction with bye-passes a system of distant control of gas-lights by means of the pneumatic switch, which consists of a pneumatic tube of small diameter, one end connected to a plunger and the other to the lamp situated at any distant point. Upon operation of the plunger the gas-valve at the lamp is caused to open or shut—thus rendering the ignition or extinction of the lamp as convenient as the control of electric lamps. The use, however, of bye-passes has objections. If a bye-pass burner should accidentally go out, through a draught or through the gas pressure in the mains being suddenly lowered, enough gas leakage might occur to cause an explosion. With the use of the pneumatic switch there would seem further possibilities of danger; for, should a bye-pass go out, the operator of the switch, when turning the gas on, might, owing to the position of a lamp, fail to have visual indication that it had not lighted-up, and a large leakage would then issue from the bunsen burner itself. A recent form of bye-pass consists of a very small burner contained in a steatite cup to shield it from draughts. It is designed to effect an economy in the consumption of gas. From the fire risk point of view, it would consequently have the advantage of allowing only a small leakage in the event of the jet going out.

I do not think it will be necessary for me to enumerate all the risks from gas lighting; and I will therefore touch upon a few points only. The danger of the swing gas-bracket and insecure piping are well known. I consider the use of rubber tubing as hazardous, especially bearing in mind the poor quality of rubber from which the tubing is now frequently made. The concentrated heat from the chimney of an ordinary vertical burner has proved a great danger to wood ceilings above. Every gas-lamp above 175-candle power should be specially shielded, and woodwork within a danger zone protected. Gas-pipes should never be allowed in contact with electric conductors or their sheathing or metallic enclosures. The inverted mantle is dangerous should it fall off when incandescent. Messrs. Burroughes and Watts have brought out a neat wire basket for fitting under inverted lights over billiard-tables. It is claimed that it throws no shadows on the table, and it should prove effective in catching the hot ring of the mantle if the latter falls.

ACETYLENE GAS.

The properties of all new products of the electric furnace seem to upset some of the well-established laws of the chemists. It is small wonder, therefore, that when the electrical product calcium carbide was found in combination with water to produce acetylene, unfortunate blunders were made in the manipulation of the gas by early experimentalists, causing many to look askance on the new form of illuminant. The principal mistakes made were in the attempts to liquefy acetylene. The gas cannot by itself be liquefied with safety, but many valuable lives were lost before this fact was established.

Acetylene is one of the most inflammable gases known, and is the most explosive when liquefied or mixed with air, oxygen, or nitric oxide. It has also an ignition-point of only 900° Fahr., as compared with 1198° Fahr. for coal gas.

The principal means by which acetylene gas is generated are as follows: (1) By allowing water to drip on to the carbide. (2) By allowing water to rise to the carbide and subside again. (3) By dropping the carbide into water. In the first case, if the charge of carbide is large, the interior of the mass upon which the water is dripping is likely to attain a dangerously high temperature, and even to get red hot. In the second case, still higher temperatures can be obtained within the mass, as, after the water has subsided, the whole of the outside of the mass has been wetted. A temperature as high as 1400° Fahr. has been found. Unlike the others, the third system is not automatic, but is the safest, as the water into which the carbide is dropped takes up the whole of the heat.

The gas is usually distributed throughout buildings by means of iron piping of small diameter; and the burners are of the flat-flame type, and of special design. Rubber tubing should never be used. Should there be an escape in the installation, it can, as in the case of coal gas, be readily detected by the odour of the gas.

PETROL VAPOUR OR "AIR GAS."

This system consists of the mixing of petrol vapour and air in an apparatus, and conveying the mixture through pipes to burners, where it is burned at an incandescent mantle. In general principle, the generator consists of a petrol container and a carburettor, driven either by a hot-air engine, by a water-motor, or by a falling weight. The percentages of petrol vapour in the carburetted air range from 1·5 to 8. Where the larger percentages are used, the mixture is further diluted with air at the burner. It is claimed for these systems that the mixture in the pipes is not explosive.

It is preferable that the petrol-tanks should be made of copper. I have seen iron tanks where some action of the petrol has reduced the thickness of the bottom to that of fine tissue paper. It would certainly seem undesirable for generating apparatus to be placed anywhere except in the open or in a separate building. Feed-pipes should have a gauze protection, in order to prevent lighting-back.

It is important to keep in mind the difference, from the fire-risk point of view, betwen petrol lighting and petrol vapour or "air gas" lighting. In the first case, petrol itself is contained within the building, either in vessels forming part of the lamp or in pipes; and methylated spirit has generally to be used in starting-up. In the second of the two systems, however, the pipes contain a mixture of air and petrol vapour only; the latter being in such small volume that, should there be a leakage, the amount of issuing vapour would for a considerable period of time form but a small percentage mixture with the air in the room.

EXPLOSIVE MIXTURES.

I will now refer to the subject of explosive mixtures, or the percentage of gas necessary to cause an explosion with air. There is great difference of opinion on this subject with regard to the exact range of explosibility of vapours and gases. Dr. Richter's figures are as follows:—

	Lowest, Per Cent.		Highest, Per Cent.
Benzene or petrol	1·1	..	4·8
Benzol	1·4	..	6·5
Acetylene	3·3	..	52·2
Alcohol	3·7	..	13·7
Coal gas	7·4	..	19·1

According to Clowes and other authorities, the limits for acetylene are from 3 to 82 per cent., and for coal gas from 7 to 29 per cent. With regard to benzene, the lowest percentage—(viz., 1·1)—would give only a very mild explosion—something, indeed, more in the nature of a flash. As to acetylene, it will be seen that it

has an enormous range of explosibility as compared with the other vapours and gases.

ELECTRIC LIGHTING.

I do not think you will expect a full discussion of this to come within our scope this evening. Pressures, wiring, fittings, and apparatus are dealt with in the rules adopted by the Fire Offices, and have formed the subject of valuable papers read before our Institutes. I would like, however, to take the opportunity of emphasizing the necessity of good materials and workmanship in the carrying-out of electrical installations. Wiring on even the most approved systems, when installed by careless or ignorant workmen, is often seriously dangerous as a fire risk. I have met with instances where the strongest of screwed steel conduit has been melted away by "fierce arcing" caused through the insulated cables they contained having been damaged through bad workmanship. Yet I think it must be considered that, given good work and material, in every case a scheme designed in accord with the particular conditions of the risk, and strict adherence to the Fire Offices' rules, electric lighting is the ideal system from our point of view. It must be remembered, however, that installations are subject to deterioration through damp, wear and tear, and the perishing of rubber insulation. Periodical testing and careful maintenance are therefore most desirable. [The author gave a few notes on electric lamps.]

FIRES CAUSED BY ARTIFICIAL LIGHTING.

Colonel Fox, of the London Salvage Corps, has kindly furnished me with some interesting figures with regard to fires in London in the year 1912. Out of a total of 3387, those due to artificial lighting were as follows: Candles, 187; electricity, 152; gas, 210; oil, 195; lighted taper, 9. There were also no less than 823 fires caused by lights thrown down. Many of these lights, no doubt, were thrown down after lighting up gas-lamps, oil-lamps, or candles. It is in this connection that electricity scores, for there is no lighting-up risk. Whatever the system of illumination in buildings, it should be thorough—*i.e.*, there should be no dark corners where it is necessary to use matches or candles. Some of the 823 lights were likely thrown down in such dark places.

BENZOL AS A MOTOR FUEL.

A Reply to Dr. Ormandy.

Reference was made to the use of gas-works residuals as motor-fuel, in a paper recently read at the Society of Arts, by Mr. W. R. Ormandy, D.Sc., F.C.S., M.Inst. Automobile Eng. [*ante*, p. 369] though the subject of alcohol was mainly dealt with. In the "Westminster Gazette" of Thursday last, Mr. J. Owen had an article, in which he expressed his belief that "alcohol as a fuel is visionary; and we shall have to consider it as such for many years to come." He does not urge that the material for producing alcohol could not be cultivated in such a quantity as would be sufficient to provide the motive force of the world, if necessary; but he does dispute that alcohol can be satisfactorily employed in existing motor-car engines, either by itself or by mixing it with other fuels, such as petrol or benzol.

Speaking of benzol, Mr. Owen proceeds, Dr. Ormandy estimates that about 1,000,000 tons of tar per annum are produced from the distillation of tar in this country, and that on the distillation of this tar a little over a gallon of benzene is produced per ton distilled. The figures are at variance with those of Mr. W. J. A. Butterfield, who estimates the total tar production in this country for 1913 as 1,558,000 tons, and goes on to say that, if all the coke-ovens in the country were fitted with tar-recovery plants, the 90,000,000 gallons of tar produced by this method in 1910 would amount to a figure approaching 200,000,000 gallons per annum. The discrepancy of 558,000 tons is worth bearing in mind. There is another point in Dr. Ormandy's deductions that merits attention. He says it is obvious that benzene produced at the rate of a little over 1 gallon per ton of coal carbonized must be considered not only as a bye-product, but as one of minor importance. It will remain an item of minor importance only so long as the old-fashioned methods of obtaining the spirit are retained. Dr. Ormandy seems fated to make his calculations on the gas-works methods, which everybody must know are not run to extract the maximum amount of spirit from coal. For example, he says that a newer and much larger source of "coal spirit" * is from the bye-product recovery coke-ovens, which are capable of yielding anything from 1 to 4 gallons of coal spirit, according to the nature of the coal and type of oven employed. If, however, he had put the average yield at about 1½ gallons, he would have been nearer the mark.

Again, Dr. Ormandy is in error when he speaks of the enormous capital that would be required for the distillation of coal at low temperatures. Very considerable improvements and reductions have been made in respect of at least one well-known system, which shall be nameless at present. We do not need to be reminded that coal spirit can be used in the present type of internal combustion engines; and if the benzolites take the view that benzol can be produced in such quantities as to influence the economic situation in the liquid fuel market in the near future, they are justified, because we possess the material and facilities for doing so. It is difficult to understand what the doctor means when he says that neither the motor manufacturer nor the using public is likely to inquire very closely into the accuracy of statements which are put to them with an air of scientific certainty. Who are the people who have dared to trespass on the domain on which Dr. Ormandy treads? Scientific knowledge is not the monopoly of any one person; it is free to all who have the understanding to practise it. But the science that is most serviceable to mankind is the one which is the most practical in its application.

The simple answer, then, to Dr. Ormandy's arguments against benzol is that the distillation of 15,000,000 tons of coal by the latest low-temperature process will give us at least 90,000,000 gallons of spirit of a quality that will increase the running mileage of motor-cars at least 25 per cent.; and this quantity is sufficient to meet the estimated demand on Jan. 1, 1915. Whether the supplemental bye-products can be satisfactorily disposed of is another matter—all things tend to show that they can. There is the difference, however, between the new and the old methods of distillation that, whereas 15,000,000 tons of coal are sufficient in the one case, about 90,000,000 tons are required in the other. Nor need we confine our enterprise to the treatment of coal. A good oil-producing shale will yield an average of well over 20 gallons of spirit per ton treated, so that the turnover of 6,000,000 tons a year would give us at least 120,000,000 gallons of motor-spirit. In this case the bye-products are of little or no value; but it has been shown that there is sufficient profit in 20 gallons of shale spirit to warrant the enterprise being undertaken.

* The term "coal spirit" was applied by Dr. Ormandy to the "spirit produced by the distillation of coal."—ED. J.G.L.

COMPOSITION OF COAL.

This subject lately formed the basis of a communication to the Chemical Society, and we have received a print of this portion of the "Transactions."

The composition of coal was investigated by Messrs. D. Trevor Jones and R. Vernon Wheeler; and they gave an account of an examination of the liquid products of its distillation in a vacuum at low temperatures, and drew conclusions regarding the composition of the "resinous substances" forming part of the coal conglomerate. A description was given of the various compounds contained in the oils obtained, which consisted largely of unsaturated (ethylenic) hydrocarbons, naphthenes, paraffins, phenols (chiefly cresols and xylenols), and homologues of naphthalene. Benzene, anthracene, and solid aromatic hydrocarbons were stated to be absent. The presence or absence of free hydrocarbons in any quantity in coal was discussed, and a hypothesis was put forward to account for the rapid formation of paraffins, naphthenes, &c., on distilling coal at low temperatures. It was suggested that such hydrocarbons must be present in the coal substance in such a manner, that while, in a sense, structurally complete, some change in their state, such as can be produced by moderate heating, must take place before they can be set free.

Professor Bone on Surface Combustion.—At the Royal Institution, Albemarle Street, W., next Friday evening, Dr. W. A. Bone, F.R.S., Professor of Chemical Technology at the Imperial College of Science and Technology, will deliver an experimental lecture on "Surface Combustion." This will also be the subject of a course of three Howard Lectures which he will give at the Royal Society of Arts on the 16th, 23rd, and 30th prox.

Manchester District Institution of Gas Engineers.—The chief item on the *agenda* for the annual meeting of the Manchester Institution next Saturday is the induction of the President-Elect (Mr. J. G. Newbigging), and the delivery by him of his Inaugural Address. The reports of the Commercial Sections will be submitted, as well as a proposal for the amendment of the rules. The proceedings will take place in the Grand Hotel, Manchester, and will be followed by tea and the customary reception by the President.

Midland Association of Gas Engineers and Managers.—Mr. W. J. Rendell Baker, of Mansfield, will deliver his Presidential Address at the annual meeting of the Association in the Grand Hotel, Birmingham, on Thursday of this week. The meeting will also consider recommendations of the Committee as to examinations for gas-fitters; and there will be an informal discussion (to be introduced by Mr. W. H. Adams, of Bilston) on the running of coal and coke handling machinery as applied to horizontal retorts.

Blok's "Elementary Principles of Illumination and Artificial Lighting."—Messrs. Scott, Greenwood, and Son send for review a copy of Vol. IX. of their "Broadway Series of Engineering Handbooks," bearing the above title. It is from the pen of Mr. Arthur Blok, B.Sc. Pending a fuller notice, it may be mentioned that the book contains numerous tables, worked examples, and 126 illustrations. The chapters are headed: The nature of light; units and standards; laws of illumination; methods and apparatus used in illumination measurement; illumination calculations; derivation of polar curves; the Ulbricht integrating sphere; reflectors, globes, and shades; indoor illumination; outdoor illumination; and the properties of illuminants. There are twelve tables and five appendices. The price of the book is 3s. 6d. net.

CONSTRUCTIONS IN REINFORCED CONCRETE.

The current number of "Concrete and Constructional Engineering" contains particulars of the employment of reinforced concrete in works in which "JOURNAL" readers are interested.

The firm of Christiani and Nielsen, of Copenhagen, have lately constructed in reinforced concrete the foundation and tank for a gasholder for the Gas Committee at Hamburg-Fuhlsbüttel. As the depth of water is rather more than 26 feet, the containing ring is subjected to a bursting pressure due to this head of water; while the rigid connections at the base introduce considerable fixing moments. For the computation, therefore, the stresses in the ring due to these two causes are the determining factors. This involves a special method of computation; the triangular area representing the hydrostatic pressure being divided in such a way that at every point the deformation due to the ring stress is equal to that due to the fixing moment. The internal diameter of the tank is 188 ft. 3 in.; the thickness of the outer wall increasing from 16 inches at the top to 3 ft. 3 in. at the base. The inner wall of the tank slopes, forming a truncated cone, the top of which is the floor of the gasholder—a plate 8 inches thick, reinforced with wire meshes, strengthened by sixteen rings near the outer edge. The base of the tank has a maximum thickness of 3 ft. 3 in., diminishing outwards and inwards.

A water-tower entirely on the Coignet system of reinforced concrete has recently been erected at Rolleston-on-Dove, near Burton-on-Trent, in connection with the water supply of the village; the Engineer for the work being Mr. John Frith, of Baslow. The tank has a capacity of 45,000 gallons, and is in the shape of a cylinder 15 feet high and 25 feet in diameter. The total height from the ground to the top of the tower is 52 feet. The interior comprises a first and a second floor; and on the latter is a balcony. Access to the upper floors is given by means of a wooden staircase. The water is forced into the tank by means of pumps; the inlet and overflow pipes being fixed inside the tower. The reinforcement is composed of round bars of mild steel. The tank was rendered on the inside with sand and cement, and was filled with water fourteen days after the concreting was finished. A slight dampness appeared at first at the junction of the wall in the bottom; but, as usual in reinforced concrete water-tanks, these signs disappeared after a few days.

In an article on "Reinforced Concrete in Municipal Engineering Works in San Francisco," Mr. E. R. Matthews, the Borough Engineer of Bridlington, gives some particulars of the Twin Peaks reservoir, which he regards as one of the finest examples of a reinforced reservoir to be found. It is oval in plan, and is divided into two parts by a reinforced concrete dam. The reservoir was designed by the City Engineer, who supervised its construction. It is situated 750 feet above the business section of the city, and is part of the high-pressure system for fire-extinguishing purposes established in consequence of the terrible fire of 1906. It is 370 ft. by 285 ft. in area, and allows for a depth of water of 27 feet, or a capacity of 11 million gallons. Owing to the dam, one half of the reservoir may be filled while the other half is being cleaned or repaired. The buttresses are spaced at 9-feet centres, and are uniform on both sides of the division wall. They are 1 foot thick and 13 feet wide at the base. On the completion of the work, one half was filled to a depth of 25 ft. 6 in.; the other being used as an auditorium in connection with the opening ceremony. Before being filled, the reservoir was washed down with cement by means of a cement "gun." A description of this operation, with some particulars of the reservoir, was given in the "JOURNAL" for Sept. 3, 1912 (p. 626). In addition to the reservoir, a pumping-station has been erected in reinforced concrete.

PROTECTING PIPES FROM ELECTROLYSIS.

An investigation into the subject of the surface insulation of pipes, as a means of preventing damage to underground metallic structures by stray currents from electric railways has lately been completed by Messrs. Burton M'Collum and O. S. Peters at the United States Bureau of Standards; and it forms the subject of Technological Paper No. 15. Tests were made of various substances available for the purpose of the insulation of underground structures—including paints, pitch and asphalt dips, pitch and paper and asphalt and felt wrappings, and so forth. Test specimens were made by lining shallow sheet-iron cones with the material to be tested. Before being subjected to the final test, each cone was filled nearly full of 10 per cent. salt (NaCl) solution, and an alternating difference of potential of 80 volts (effective) applied across the coating for 30 seconds, in order to be sure that it was continuous and without flaws. A milliammeter in series with the specimen indicated a defective coating by a kick of the needle. The electrical resistances of the perfect specimens were then approximately determined with a Wheatstone bridge. In the case of the paints, these resistances were found to be of the orders of from 10^5 to 10^{11} ohms per square centimetre; while for the wrappings they were much higher.

The final tests of the specimens which survived the preliminary test consisted in allowing water and air alternately to come in contact with the coating while a direct potential difference of either 4 or 15 volts was applied across the coating. The value of the voltage applied depended on the thickness and other characteristics of the coating. In some of the specimens made up from each material, the iron of the cone was made negative and in others positive; while in the case of the paints, some of the specimens were subjected to the alternate action of air and water with no potential difference applied, in order to check-up the effect of the electric stress.

The alternating contact with the coating of air and water was obtained by filling the cone and allowing the water to evaporate, which took about a week. Readings of the current flow were made at suitable intervals; the first appearance of current flow being taken as indicating the end of the useful life of the specimen as an insulating coating.

The average life of the paints was about 116 days; the maximum life obtained from any specimen being but little more than a year. No conclusive evidence was obtained that the low potential differences applied had any effect in hastening the initial failure of the coatings. The wrappings lasted longer than the paints and dips, but none of them much more than 400 days. It seems from the results that the failure of the coatings must be caused by absorption by them of water, which in time penetrates to the iron, allowing current to flow and destroy the coating by electrolysis. After the first appearance of current flow, the destruction of the coating was observed to proceed very rapidly.

The conclusion drawn from the results of the laboratory tests —*i.e.*, that the protection against electrolysis which is obtained by wrapping or painting pipes or other metallic bodies for use underground is only temporary—is borne out by tests on insulated pipes buried in the ground under practical conditions, and also by correspondence with gas and water companies, whose experiences lead to the same conclusion.

Mr. Tooth's Lectures on "Gaseous Combustion."—In the report of the third of Mr. L. F. Tooth's recent lectures on "Gaseous Combustion" [*ante*, p. 429], there was given a table showing the comparative results of coke and gas-fired furnace workings in a brass foundry. The lecturer points out that in reproducing the last line of this table in our pages the word "months" has been inserted instead of "charges." The line should read: Average life of pots, coke-fired furnaces 30 charges, gas-fired furnaces 40-45 charges.

Local Legislation for Last Year.—We have received from Messrs. Walter Southwood and Co., Limited, of No. 30, Craven Street, W.C., a work bearing the title of "Local Legislation, 1913." It is a collection of provisions contained in Private Acts of Parliament obtained by Provincial Corporations and Urban District Councils in England and Wales, after consideration by the Local Legislation Committee of the House of Commons. It has been compiled by Mr. F. Noel Keen, LL.B., of the Parliamentary Bar. The text occupies 304 pages, and the tabulated headings and index bring up the number to 348. The book will be noticed more fully in a subsequent issue of the "JOURNAL." The price, if ordered before the 31st prox., is 7s. 6d. net; after that date it will be 10s. net.

Municipal Gas Accounts for 1912-13.—We have received from Messrs. John Allan and Co. their "Analyses of Municipal Gas Accounts" for 1912-13. The accounts of 78 municipal gas authorities are analyzed, all the items of revenue and expenditure being worked out at per 1000 cubic feet of gas sold. The makes range from 29 millions to upwards of 9164 millions per annum. Comparisons can be made of the gas produced and sold per ton of coal, of the residuals yielded, of the capital charges, and the capital employed, &c. To allow of easy comparison of one account with another, cardboard rules, either in blank to allow of figures being filled in, or with the figures of any particular undertaking in the series printed upon them, are, as before, supplied with the "Analyses." The price of the work is 10s. 6d. net.

Failures of Dams.—A paper on this subject was read last Wednesday before the Liverpool Engineering Society, by Mr. J. R. Davidson, Assoc.M.Inst.C.E., of the Corporation Water Department. The author remarked that unsound foundations had been the most fertile source of disaster to masonry and concrete dams; while in the case of earthen embankments either inadequate provision for dealing with floods or faulty arrangements for drawing-off water had been chiefly responsible for failure. Two of the three masonry or concrete dams to which he referred had failed in quite different ways through faulty foundations; and the third was a case of pure overturning. The dams referred to were: The Puentes dam, in Spain; the Bouzey dam, near Epinal, on the River Avière, one of the tributaries of the Moselle; the Dale Dyke or Bradfield reservoir, of the Sheffield Water Company; and the South Fork and Austin dams, Pennsylvania. After referring to the troubles which brought about these failures, Mr. Davidson said the lessons to be learnt might be broadly summarized as follows: A gravity dam of masonry should be wholly founded on rock, and tensions should be practically non-existent in such a dam. In an earth dam settlement should be provided for, and unequal settlement prevented. Adequate provision should be made for exceptional floods under all conditions; and a secure foundation and prevention of uplifting were necessary in masonry and concrete dams.

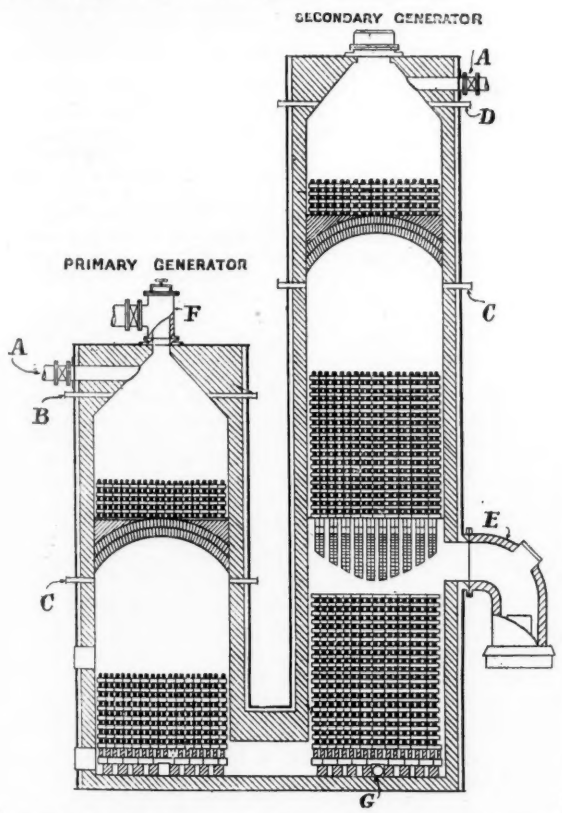
THE MANUFACTURE OF OIL GAS.

The Improved Jones System.

In the "JOURNAL" for the 30th of December last we reproduced from the "American Gas Institute News" an article by Mr. Alfred E. Forstall describing the Jones system of oil-gas manufacture. In the number of the "News" for last month he continued his article, and gave the following particulars of the improved plant which has been devised by Mr. Jones.

When the manufacture of oil gas by the Jones process was begun, high heats were employed, and the gas produced contained high percentages of hydrogen, while a great deal of lampblack was set free. At the present time the common practice is to have the temperature at the top of the primary generator at the beginning of the run from 1800° to 2100° Fahr., and that in the secondary generator at about 1800° Fahr. During the run the temperatures drop, until at the end they are about 1200° in each shell. With these limits of temperature the percentage of hydrogen in the gas is lower, and that of marsh gas higher, than was the case during the early years of the operation of the process.

In the process as now ordinarily carried on, practically all the oil, oil vapours, and gases are exposed to contact with the highly heated surfaces of the chequer-brick without the presence of any protecting and carrying gas. Because of this, even with the lower heats now employed, a large quantity of carbon is set free in the form of lampblack, and must be disposed of. Since a certain total amount of hydrogen and marsh gas must be produced to carry the heavier hydrocarbons, it is necessary to set free a certain amount of carbon; so that this feature of the process can never be entirely eliminated while oil is the only raw material used. This is true no matter what the character of the oil used, even though the gasifying of the oil could be entirely effected by means of radiant heat without any contact with hot surfaces. But the quantity of carbon which it is necessary to set free can be reduced by increasing the percentage of marsh gas, and reducing that of the hydrogen in the finished gas.



A. Gas inlet for catalyzer. B. Inle for oil for heating and steam for gas making. C. Oil burners. D. Steam inlet for gas making. E. Common gas off-take for both shells. F. Blast. G. Secondary blast.

Improved Jones Oil Set.

Reasoning from the fact that because of the protecting action of the atmosphere of water gas, into which the oil used for carburetting is injected in the manufacture of carburetted water gas, this oil stands exposure to contact with fire-brick heated to a temperature as high as, or even higher than, that employed in the manufacture of oil gas without the formation of lampblack, the manufacturers of oil gas were led to experiment upon the use of a protecting gas. The first experiments were made by sending steam into the apparatus without any oil during the first minute of the blow; the idea being that the steam would be dissociated and produce an atmosphere of hydrogen and oxygen, into which the oil would be injected. This apparently, during the first two or three minutes after the injection of oil began, produced a good effect, which, however, disappeared during the latter part of the run. The idea of employing water gas as the protecting medium was considered, but abandoned, because the goal sought was the elimination of the residual lampblack, and this was the only economically available source of carbon for the manufacture of water gas. It was finally decided that a portion of the oil gas already made should be used as the protecting medium; and experiments along this line, which have proved quite successful, are described in a paper read by Mr. L. B. Jones before the meeting of the Pacific Gas Association, held last September.*

Coincidently with passing through the apparatus during a run a portion of the previously made oil gas, another forward step seems also to have been taken in omitting fully one-third of the chequer-brick previously employed, leaving empty the space formerly filled by the brick; so that in passing through it the oil vapours are exposed to radiant heat only, and, in addition to being protected by the oil gas introduced, are also subjected to a smaller exposure to contact heat. This change in the amount of chequer-brick is shown by the accompanying illustration of the improved Jones oil-gas set, which may be compared with the view of the older form of the apparatus already given. [See "JOURNAL" for Dec. 30, 1913, p. 1020.]

The adoption of the use of this protecting-medium, and the doing away with a large proportion of the chequer-brick and the substitution in its place of large open spaces in which the gas is exposed to radiant heat only have resulted in a reduction in the percentage of hydrogen in the finished gas, with a corresponding increase in the amount of marsh gas—the total percentage of the hydrogen and marsh gas together showing a small increase. Since marsh gas has a much higher calorific value per cubic foot than hydrogen, and also forms a better basis for enrichment by the heavy hydrocarbons in the gas, the gas resulting from this new method of manufacture has not only a higher calorific value, but also a higher open-flame illuminating value. In addition, more of the carbon in the oil is present in the gas, and therefore less is set free either to remain in the plant and be burnt during the succeeding blow, or to be carried out by the gas and removed and disposed of.

The differences in the character of the gas made in the several ways are shown by the following analyses:

	Crude Oil Gas as First Made.	Oil Gas Made with Lower Heats.	Oil Gas Made with Protecting Medium.
Illuminants (C_nH_{2n})	6·2	6·8	6·6
Marsh gas (CH_4)	25·6	35·5	38·2
Hydrogen (H_2)	62·4	40·1	39·3
Carbon monoxide (CO)	3·0	8 8	5·1
Carbon dioxide (CO_2)	0·2	2·2	3·6
Oxygen (O_2)	0·4	0·2	0·0
Nitrogen (N_2)	2·2	6·4	7·2
	100·0	100·0	100·0
Candle power	18·6	19·69	..
Calorific value, B.Th.U.	624·0	685·co	695·0

The amount of dry lampblack obtained when employing high heats was as much as 30 lbs. per 1000 cubic feet of gas made. This was brought down to from 10 to 15 lbs. by the use of lower temperatures, and is now reduced to about 5 lbs. per 1000 cubic feet with the employment of the protecting medium.

In the paper referred to, Mr. Jones speaks of the oil gas introduced as being a catalytic agent; and he attributes the extra amount of the marsh gas to a combination, because of the presence of this catalytic agent, between some of the hydrogen and some of the carbon that would otherwise have gone into either carbon monoxide or carbon dioxide. It seems probable, however, that the catalytic effect of this gas, if it has any, is unimportant, and that the increased percentage of marsh gas and the decreased percentage of hydrogen are really due to the combined effect of the protecting action of the previously made oil gas, in the presence of which the oil is gasified, the reduction in the number of chequer-bricks employed, with a corresponding increase in the extent to which radiant heat is allowed to operate, and a possible formation of marsh gas by reactions occurring between the hydrogen and the carbon monoxide. The amount of lampblack recovered from the gas (as given above) is not in any case the total amount of carbon which is set free in the apparatus, since a large portion is retained on the surfaces of the chequer-brick.

In connection with the new method of operation during the runs described above, it has been found that, by introducing air at several points in the set and a lower total rate during the first five minutes of the heating-up period, without any oil, it has been possible to bring the set up to the proper heat with the use, during the last five minutes of the heating-up period, of only 55 per cent. of the amount of heating oil formerly employed. This shows a saving of 0·5 gallon of oil per 1000 cubic feet of gas made. Knowing the analysis of an oil gas, and the ultimate analysis of the oil from which it is produced, the total weight of carbon which must have been set free in the form of lampblack during the manufacture of the gas can be calculated in the following manner: All the hydrogen, both free and combined, contained in the gas must come from either the oil or the steam used in its manufacture. The hydrogen obtained from the steam may be

* A lecture on the subject of "The Manufacture of Oil Gas" was also delivered by Mr. E. C. Jones [see "JOURNAL," Vol. CXXIII., p. 622].

taken as that corresponding in the steam to the weight of oxygen found, either free or in the carbon monoxide and carbon dioxide in the gas; and the difference between the total weight of both the free and the combined hydrogen in the gas and the weight of the hydrogen derived from the steam is the weight of the hydrogen obtained from the oil. This hydrogen is associated in the oil with a certain amount of carbon; while the gas contains a different amount entirely derived from the oil used.

Taking the analysis of the oil gas made with lower heats, as previously given, and assuming that the oil used in its manufacture contains 85·5 per cent. of carbon and 11·5 per cent. of hydrogen, which is about the average composition in respect to these two elements of Californian petroleum, the calculations work out as follows: The weight of oxygen in the carbon monoxide in 1000 cubic feet of oil gas is equal to the product of the number of cubic feet of carbon monoxide in this quantity of gas—*i.e.*, 88, the weight of a cubic foot of carbon monoxide, which is 0·074 lb., and the percentage by weight in which oxygen is present in carbon monoxide, which is 57. Substituting the proper decimals for the figures for percentage, the weight of oxygen in the carbon monoxide contained in 1000 cubic feet of gas is therefore $88 \times 0{\cdot}074 \times 0{\cdot}57 = 3{\cdot}71$ lbs. The corresponding figures for the oxygen contained in the carbon dioxide in 1000 cubic feet of the gas are $22 \times 0{\cdot}116 \times 0{\cdot}73 = 1{\cdot}86$ lbs. The amount of free oxygen in the gas, as shown by the analysis, is 2 cubic feet, or 0·17 lb.; and the total weight of oxygen per 1000 cubic feet of the gas is 5·74 lbs. Since oxygen and hydrogen are combined in steam in proportions of 8 parts by weight of oxygen to 1 part by weight of hydrogen, the weight of hydrogen corresponding to this weight of oxygen, and therefore obtained from the steam, will be $5{\cdot}74 \div 8 = 0{\cdot}72$ lb.

Assuming the illuminant to be ethane (C_2H_6), the total weight of hydrogen in 1000 cubic feet of the gas—obtained by multiplying in each case the number of cubic feet of the substance in 1000 cubic feet of the gas by its weight per cubic foot, and the product by the proportion by weight of hydrogen to the total weight per cubic foot—will be as follows:

In ethane	$68 \times 0{\cdot}079 \times 0{\cdot}2$	$= 1{\cdot}08$ lbs.
In marsh gas	$355 \times 0{\cdot}042 \times 0{\cdot}25$	$= 3{\cdot}73$,,
Free hydrogen	$401 \times 0{\cdot}0053 \times 1{\cdot}0$	$= 2{\cdot}12$,,
		6·93 lbs.

Since 0·72 lb. of hydrogen has been derived from the steam, 6·21 lbs. must have come from the oil; and the oil containing, as stated above, 85·5 per cent. of carbon and 11·5 per cent. of hydrogen, this weight of hydrogen was associated in the oil with a weight of carbon which is obtained from the following proportion.

$$85{\cdot}5 : 11{\cdot}5 :: x : 6{\cdot}21$$

Working out this proportion, the weight of carbon in the amount of oil which will contain 6·21 lbs. of hydrogen is found to be 46·2 lbs.

The gas contains in the carbon monoxide, carbon dioxide, ethane, and marsh gas a total weight of carbon worked out as follows:

In carbon monoxide . .	$88 \times 0{\cdot}074 \times 0{\cdot}43 =$	2·80 lbs.
In carbon dioxide . . .	$22 \times 0{\cdot}116 \times 0{\cdot}27 =$	0·69 ,,
In ethane	$68 \times 0{\cdot}879 \times 0{\cdot}80 =$	4·30 ,,
In marsh gas	$355 \times 0{\cdot}042 \times 0{\cdot}75 =$	11·18 ,,
		18·97 lbs.

Subtracting this weight of carbon in the gas from the total weight of carbon in the oil required to furnish the hydrogen obtained from the oil, there is a remainder of 27·23 lbs., which must have been set free in the shape of lampblack. If only from 10 to 15 lbs. of actual dry lampblack are recovered from the gas, from 12 to 17 lbs. per 1000 cubic feet of gas made must remain in the apparatus, to be either blown out or burnt during the succeeding blow. It is this lampblack which is burnt with a light blast introduced at several points, as previously described.

The weight of gas, as calculated from its analysis, is 36·38 lbs. per 1000 cubic feet. Of this, 6·46 lbs. are obtained from the steam and 29·92 lbs. from the oil. With 27·23 lbs. of carbon set free in the form of lampblack, the total weight of oil required will be 57·15 lbs. Oil of a gravity of 18° Baumé weighs 7·89 lbs. per gallon, so that a weight of 57·15 lbs. corresponds to 7·24 gallons of oil; and this is the minimum volume which will apparently be required to produce 1000 cubic feet of gas of the composition shown by the analysis, upon which the previous calculations are based. If a larger volume of oil is employed for making the gas, apart from that used for heating the set, the difference is simply the loss which is inseparable from any manufacturing operation.

Under the title of "Fuel: Solid, Liquid, and Gaseous," there has just been issued (price 12s. 6d. net) a volume from the pen of Mr. J. S. S. Brame, F.C.S., Instructor in Chemistry at the Royal Naval College, Greenwich, and Lecturer on Fuel at the Sir John Cass Technical Institute. The subject is exhaustively treated under four headings: Solid fuel, liquid fuel, gaseous fuel, and the analysis and calorimetry of fuel—the last section including also the question of purchase on a calorific basis and the scientific basis of combustion. Pending a review of the book, it need only now be added that the publisher is Mr. Edward Arnold, of Maddox Street, W.

DOMESTIC FUEL APPLIANCES.

At the last meeting of the American Commercial Gas Association, a report on the use of domestic fuel appliances was presented by a Committee specially appointed to consider the subject. They dealt first with the adaptability of the appliances, next with the methods of buying and selling them, and finally with the system of following them up after they have been installed. We give below some extracts from the report.

Ranges.

There is no need to give space to a statement as to why the gas-range should take first position or receive more attention than the other domestic appliances. We see many other appliances taking a place in our computations that only a few years ago we should not have dared even to anticipate; but still the fact does, and always will, remain that "The cook will not be suppressed." Therefore, the gas-range will continue to figure as always, supplying something that is near the "back-bone" of the industry.

The four fundamental reasons for the use and popularity of the gas-range which emphasize and establish its peculiar adaptability are: (1) Economy of operation; (2) efficiency, doing more and better cooking than the best appliances using other fuels; (3) convenience of operation, lessening kitchen work; and (4) cleanliness, as it avoids the deterioration of property and household goods occasioned by the use of coal. From the standpoint of the gas company, the gas-range is of interest because of the gas sales it produces.

A very large proportion of the increase in gas sales must come from the increased usage of the ranges already placed, by the large number of consumers owning them but not using them for cooking during the winter. This can only be accomplished through the "all gas kitchen"—which is not taken advantage of by the public to the extent that the merits of such an arrangement warrant. The factors most antagonistic to the use of gas as a kitchen fuel throughout the year are the heating of the kitchen in cold weather and the heating of water. We are in a position to take care of the latter condition through the already growing demand for the gas water-heater; but our greatest difficulty has been in caring for the former.

The greatest difficulty that has been encountered in the installation of "all gas kitchens" in the older dwellings has been the cost of providing means to heat the kitchens. We believe, however, that this objection is one that can be overcome by constant and determined effort in placing before consumers the fact that such an installation is possible and practicable, for if the public can be made to realize the advantages of the "all gas kitchen" in cleanliness, comfort, and efficiency, they will spend the money necessary to make the changes that are required in their house-heating equipment. We are convinced that our greatest hope for future increases in domestic fuel sales lies here.

Electric companies are now exploiting electric cooking-ranges, hot-plates, water-heaters, and similar appliances. Tests have shown that to raise six pints of water from 58° to 212° with electricity, the cost at 10 c. per kilowatt-hour was 3·68 c., while gas at $1 per 1000 cubic feet would do the same work at one-tenth the cost. The comparative costs of cooking are approximately in the same proportion. Electric cooking appliances are being developed to produce a higher efficiency; and the almost prohibitive cost of both the appliance and its operation is gradually being reduced. The statement that the gas-range does cooking more "conveniently" than any other appliance may have to be modified; but that it does the best possible cooking at very small cost needs no further argument or proofs. These substantiated claims are sufficient to keep the gas-range at the head of all other cooking appliances—a position which it is not likely soon to lose.

Water-Heaters.

The circulating water-heater takes position next to the gas-range in value to the gas company; and while its return in yearly consumption averages lower per unit than the range, it is advocated on lines continually increasing in extent. Its value must not, however, be looked upon merely from the standpoint of its individual consumption. Its installation forms part of the progress we should make in building-up our total domestic fuel gas sales; for it is an important part of the "all gas kitchen," and has a direct bearing upon the increased use of the gas range and the resulting consumption. As has been said before, one of our great possibilities lies in securing a larger consumption from the appliances already installed. Anything that can be done towards installing another unit that is satisfactory to the consumer is a step forward; and from this standpoint the circulating water-heater offers possibilities second to none.

Water-heaters seldom require additional investment for mains, meters, or services—an important factor to be considered. From statistics gathered from a number of companies we learn that one water-heater is installed to every 55 people of the total population supplied. The United States census shows 5·5 people to every family. Therefore, there is one water-heater installed to every ten families. This is significant, in that it so clearly proves the marked possibilities for increasing the sale of water-heaters.

With the automatic water-heaters of approved types, it becomes nearly as great a question "where not to put them" as "where to put them." A review of the most severe objections raised to

their purchase and some satisfactory remedial suggestions follows: (1) When the initial expense of installation makes the prospective consumer hesitate, it may be suggested that it really resolves itself into a portion of the investment rather than an expense, and is comparable to plumbing fixtures, a slate roof, or the building of an additional room. (2) When the question of the life of the heater and cost of repairs is raised, call attention to the fact that its construction of cast iron and copper makes probable its greater longevity than the needs of any purchaser; and repairs are made by the gas company at a minimum cost. (3) When inquiry is made as to the cost of operation, accurately explain that this depends upon the number of gallons of hot water drawn. An average cost of 1 c. per 10 gallons of water is generally used (gas at $1 per 1000 cubic feet). The ordinary home averages from 2000 to 4000 gallons of water heated per month.

Trial installations carefully followed up have been made very successfully by a number of companies. Long-term payments can be advantageously adopted, as household buying of any sort seems to be greatly increased when the privilege of time payments is granted. The field of the automatic water-heater is increased by its adaptability for use in restaurants, saloons, barber shops, doctors' and dentists' rooms, &c.

The instantaneous water-heater is one of the appliances of which the practicability is most seriously questioned. Some condemn it. It is not necessary that the Committtee should enter into the *pros* and *cons* of the discussion. Every man who is endeavouring to give his constituents what they desire, tempered by what he thinks they need, is to be safely trusted in his judgment; for we believe it is a matter to be governed by local conditions.

Hot-Plates.

The firm foundation now established for the gas-range in America has in some degree been built up by the preliminary use of the hot-plate. It is unquestionably an educator, as an experience with the utility of the blue gas flame for cooking is a stepping-stone to the more complete appliance with the ovens. It is not altogether wise to continue to make this educational feature the paramount claim for the adaptability of the hot-plate. We are apt to forget that there is always a more or less large number of small tenements where the use of gas in the hot-plate is better than no gas at all. The portable ovens and the greater efficiency now secured in small ovens of the portable kind, owing to a wider experience in insulation and construction, often give satisfactory baking and roasting service, and produce quite a desirable business. But let us remember that, while the hot-plate has its mission, the greater advantages and economies of the gas-range should be explained and emphasized wherever its cost can be afforded.

The gas-heater is primarily a "seasonal" appliance; and this, together with the peculiar characteristics of the average consumer of his inability to see the advantage of purchasing an appliance to guard against future contingencies, makes it useless to undertake to force the sales unless it be strictly in season. To be in a position to recommend with a fair degree of accuracy the proper heater for the proper place, requires a knowledge of how to compute radiation. It is impossible to adopt a hard-and-fast rule which would cover the thousand-and-one problems which are continually arising; and it is not the purpose of the Committee to maintain that the constants used in the following problems always remain the same. For instance, the loss of heat units for every square foot of exposed wall varies in accordance with the material with which it is constructed, and also its thickness, the exposure, and the amount of ventilation. It is thought, however, that the following problem will serve to illustrate a reasonably reliable method for computing the required size for most gas-heaters:

Problem.—To heat a room 15 ft. by 15 ft. by 10 ft., having no other source of heat, with a total glass area of 36 square feet and an exposed wall surface of 150 square feet, to a temperature of 70°, with an outside temperature of 30°.

Solution.—By multiplying the total glass area by 1·3, which is the number of B.Th.U. lost for every square foot of glass, and then multiplying this by the difference between the desired and the outside temperature, which in this case is 40°, we ascertain the B.Th.U. loss to be 1872. We then by the same process find the B.Th.U. loss in the exposed wall to be 1920; the only difference being that instead of multiplying by 1·3, we use the figure 0·32, as there is only 0·32 B.Th.U. lost for every square foot of exposed wall surface. To determine the loss caused by ventilation, the cubical contents should be multiplied by 1, and this result multiplied by the difference between the desired and the outside temperature. This product is then divided by 50, the number of cubic feet of air heated by one B.Th.U.; and we find the answer to be 1800. To ascertain the total number of units lost, we add the above figures together, and find it to be 5592. This sum is then divided by the number of units per cubic foot of gas, which we assume in this case to be 600. This quotient, which we find to be 9·3, represents the number of cubic feet of gas per hour necessary to keep the temperature at 70°.

Gas-heaters, however, are installed to secure quick heating results; and while the amount of gas given in the above calculation is approximately what would be required per hour to maintain the temperature in the room throughout a given period of time, practice would necessitate the installation of a heater burning a maximum of about three times this amount (or a consumption of 28 cubic feet per hour), in order to bring the temperature of the room to 70° within 20 minutes.

Gas-Irons.

Second only to the immense proportions to which residence lamp selling became popular within the past two or three years stands the new history of the gas-iron. It is not safe to give all the credit to any special selling scheme, but it is a striking evidence of the result of attention becoming focussed upon the apparent need for such an appliance. Such strides in improvement were seldom seen, and almost immediately there were a number of scientifically constructed irons to choose from. The result is an efficient appliance with an ever-increasing demand and a serious encroachment from electric competition at least materially checked. The value of this appliance cannot be looked at from the standpoint of its individual consumption, but rather by its effect upon the use of the gas-range, for experience proves that in many localities, where consumers have both gas and coal ranges, the coal-range is used largely on ironing day, not only for the heating of irons, but, as is natural, for cooking meals. With the gas-iron used for ironing, the gas-range is used for cooking.

Laundry Stoves, Toasters, and Miscellaneous Appliances.

To give a separate special discourse on laundry-stoves, garbage incinerators, toasters, and the various miscellaneous appliances or utensils, would mean simply to give space to that which may be covered in a general statement. Their adaptability and time and labour saving convenience make the continuance of gas-fuel a necessity. Two of the most novel developments in recent years in the application of gas to domestic uses have been the gas-operated vacuum cleaner and ice-making machine. The removal of dust and dirt from the home and the cooling of eatables are important factors in modern life. Appliances operated by gas which accomplish these two results are now manufactured, and from every indication will soon be commercially practicable.

The principle of the vacuum cleaner is that of the steam ejector; the steam in this instance being produced by the heating of water in a copper coil above a gas-burner, in the same way as with the automatic gas water-heater. The machine is operated by a valve controlling the water-supply pipe leading into the cleaner; the gas being automatically turned on and ignited by a pilot-light. The cleaner is connected by pipes concealed within the wall to the various rooms of the house, terminating in fittings in the baseboard, which are covered when not in use. Cleaning-tools attached to a rubber hose are connected to these openings when it is desired to operate the cleaner in the room, and the dust is taken out through this piping system to the outside of the house—a large part of it being consumed by passing through the gas-flame. There appear to be commercial possibilities in this machine, particularly for its installation in buildings under construction, where the piping leading to the various rooms can be installed at the minimum cost.

Appliances operated by means of gas are now being manufactured for the purpose of refrigeration. In this machine a solution of ammonia is heated by a gas-fired burner, and the ammonia gas thus driven off forms the cooling agency, and is used over and over again, as, after leaving the refrigerator, it is condensed by means of water—the condensed liquid passing back into the original cylinder to be reboiled. Tests show that the cost of operation is lower than the usual cost of ice purchased for the household. The machine is no more complicated than automatic instantaneous water-heaters; and there appears to be nothing to prevent the possibility of it being developed in the future to such an extent that it will find a ready market.

Buying, Selling, and Following the Sale.

There is a time in the history and evolution of all great industries when the hitherto more or less insignificant regular trend of operations takes on gigantic proportions with no outward display of cause. We may or may not be approaching such an epoch. At any rate, we are definitely confronted with the calm, cold fact that during the last ten years our only great advance has been in "selling efficiency." We are asking for, buying, and placing the same ranges, the same hot-plates and water-heaters. Their appearance, form, and minor details have received a certain amount of attention and change; but actual productive efficiency in most of the commonplace appliances remains within a 10 per cent. radius of advance. We reticently admit superiority, and feel no thrilling note of fear for our future. But is this sufficient reason for inaction? There are those who think not. Therefore, it becomes worth while to inquire slightly into the situation. It is unanimously conceded that the present plane of electric ingenuity is directly traceable to the manufacturers of electrical appliances. This is not in itself any proof that the gas appliance manufacturer is responsible for our inertia. Far be it from true. But do we give the attention and encouragement that we should to have the appliance manufacturers produce improvements? Are we inclined to make the price factor too dominant in our purchases? The price, of course, should be a factor, but only one. Quality and improvement must be given just as close, if not more careful, attention. Are we not inclined to pass them over too lightly, to our own loss, for we lose not only their immediate value, but give the appliance manufacturers the impression that we are not particularly interested in them, and thus discourage improvement.

The men who represent the commercial departments of gas companies are in a position to observe closely the results which consumers secure from appliances under actual operating conditions—to know the objections that arise to present appliances, and the results that the public want. In other words, they are in

a position to know the "market." The commercial representatives of the gas companies must give the appliance manufacturers the benefit of the knowledge that comes to them from the very nature of their positions. Co-operation between the two can have but the result that honest co-operation always produces —mutual benefits.

We need not outline all or any of the various applications of untiring energy and proved ability that are bringing magnificent returns in the selling of appliances and therefore gas. We wish, however, to emphasize the opinion that the fundamental principle in the sale of domestic fuel appliances must be the organization of a force of men trained to this particular field of endeavour. It is a particular field, because it embodies not only the requirements of retail salesmen in other lines of business, but necessitates the courage of a canvasser in gaining an audience and creating a demand. It is a field to which we must attract the best type of individuals; and to do so the salary must be commensurate with the effort required. They should be encouraged and helped in educating themselves, and, as they develop, should be compensated in proportion to the business gained through them. Compensation on a basis accumulative in proportion to the business secured brings out the best that is in a good man. He therefore works the harder; for he knows that good work brings its immediate financial return to him as an individual.

The best salesman, however, cannot succeed without a sales plan. Study carefully your particular local situation, and outline your plans to meet it. Know why you are not selling water-heaters, heating-stoves, &c., and back-up your work and your men with plans for overcoming the objections they encounter. We feel that the basis of any sales plans should be liberal terms of credit. This has been found necessary in other lines of business, and our business should be no exception to the rule. Terms are more important than prices; and we recommend that on the larger appliances, such as ranges and water-heaters, you should allow at least a year's credit—permitting consumers to pay for them in equal monthly instalments. The same thought should be carried out in regard to the smaller appliances, such as gas-irons and heating-stoves. Advertise your policy, your advancement, your desires. Make a big-minded effort to overcome the opinion, if it exists in your community, that you are set, unreasonable, and dogmatic in your ideas.

We are learning that advertising is not confined to saying things in printed form. Demonstrating and following up the installation of appliances has brought an untold gain, in proving adaptability and opening new fields. The one time demonstrator has graduated into an instructor, just as a canvasser has become a salesman. Teaching the economy of time and energy as well as cost has made her position as strong and necessary to successful new business organizations as the birth of the idea was original. She must be a sort of "walking encyclopædia," as well as an inspector enough to see that the range and water-heater are properly connected and adjusted, and the other appliances giving satisfaction. She should suggest the smaller utensils, such as toasters, &c., though she should not try to force sales, as a great portion of her value has come through the consumers' realization that some care is given by the company without apparent desire for money. The number of calls that she should or could make varies; but the comparison from many cities shows an average of about eighteen per day when conscientiously caring for her multiplicity of duties. The question of the number of demonstrators to employ is still an open one, and varies greatly. One company employs an average of one demonstrator to every 7500 consumers; but, on the average, there is one demonstrator to every 15,000 meters in service.

Recommendations.

We submit the following recommendations:

1.—Closer study of buying methods, and more co-operation between the commercial representatives of gas companies and appliance manufacturers, which will sensibly encourage a thorough and more diversified form of experimenting on the possibility of improving the efficiency of domestic fuel appliances.

2.—Active and unqualified support of the educational course of the Association.

3.—More attention to windows and office displays and more hearty support in affording fellow-members, through the "Bulletin" of the Association, an opportunity for studying the best displays that you make. We recommend a standing Committee or Sub-Committee to attend to the collection of this information and its publication.

4.—More attention to the value of the installation of various appliances, so that an equitable basis of remunerating your salesmen for the business they secure can be formed.

5.—That liberal terms of payment on appliances be made the basis of sales plans.

6.—That a Sub-Committee be appointed to formulate plans whereby a member of the Association should be delegated to attend the annual convention of architects, to stimulate interest in the applications of gas on the part of the architects.

Mr. Frederick Taylor, who was for many years Secretary of the Warrington Corporation Gas Department, left estate of the gross value of £10,268.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

Visit to the Granton Gas-Works.

A party of about ninety members of the Western District Division of the Scottish Junior Gas Association, including Mr. J. Wilson (President), Mr. T. Carmichael (Vice-President), Mr. D. Fulton (Hon. Secretary), Mr. F. L. M'Laren (ex-President), and Mr. J. M'Ghee, of Glasgow, paid a visit of inspection on Saturday afternoon to the works of the Edinburgh and Leith Corporations' Gas Commissioners at Granton. On their arrival at Princes Street Station, Edinburgh, they were met by Mr. A. Masterton, the Engineer and Manager of the works, and were conveyed by special train to Granton. It was an ideal day, and the party thoroughly enjoyed the inspection.

Mr. Masterton, in extending to the members a cordial welcome, expressed the hope that they would enjoy the visit, and find in it profit and entertainment, so that they would carry away with them pleasant memories of the day's outing.

Dividing up into parties of ten, under the direction of the general foreman (Mr. J. Macgillivray) and some of the subordinate members of the staff, they were taken from one section of the works to another, and furnished with particulars regarding the plant and appliances, which have been fully described in the "Journal." It was explained that the large four-lift telescopic gasholder had a capacity of 6½ million cubic feet, and that the coal stored in the works was about 40,000 tons.

Attention was directed to the coal-crushing plant, which is capable of crushing the contents of a 12-ton waggon; the whole process, including the elevating, occupying only seven minutes. Further interest was found in the retort-house, with its up-to-date machinery; as well as in the workshop, which is one of the main features of the works.

Considerable interest was taken in the kitchen, or canteen, in which the employees obtain their meals at a very moderate cost, and which also serves as a reading-room. Each table is provided with a slate, on which the workman puts down what he requires for breakfast, and the meal is served at the time he fixes. By means of an overhead railway, much time and trouble are saved in distributing the dishes. No profit is allowed to be made on the food. Attached to the works is a garden, where the men grow their own vegetables. There is also up-to-date lavatory accommodation, with salt-water baths and washhand basins.

After visiting the bye-products works, the party adjourned to the Technical Office, where tea was served, under the presidency of Mr. Masterton.

Hospitality to the Visitors.

The President, in moving a vote of thanks to Mr. Masterton and his subordinates for the trouble they had taken in showing the members of the Association round the works, said that when he came into Granton—his first visit—he thought he had made a mistake, and had come across one of those elusive sanatoria they often read about. [Laughter.] The appearance of the works was very delightful; and in saying this, he thought he was voicing the views of his companions. The works were certainly a monument to Mr. Herring, and he might also say to Mr. Masterton. They would stand there for posterity to show what brains, with money at the back of them, could do. Of course, some of them thought they were perhaps a little too elaborate: but they could not but admit that they were certainly impressive. He asked the members to give a very hearty vote of thanks to Mr. Masterton and all those who conducted them round the works.

The request was cordially complied with.

Mr. Masterton, replying on behalf of himself and his assistants, said he acknowledged with much gratitude the vote of thanks which Mr. Wilson had just proposed. It had been a great pleasure and honour to have had a visit from the members of the Western District Association, and he trusted that some, if not all, of them had learned something which would be of use, either at the present time or in the future, so that they would leave Granton feeling that they had been gainers and not losers by their inspection of the works. It had been a very great satisfaction to himself, and, he believed, to others, to know there had always been a cordial feeling of good-fellowship between the Associations, and that the members were keen to visit each other's works to see what was new and ascertain the lines of progress. Mr. Fulton had handed him a few particulars from which he was pleased to learn that the Western District Division of the Association was showing signs of continued increase, and that the membership at the present time was 215. He understood that the meetings had been well attended, and that there had been quite a large number of interesting and instructive papers read and lectures given. As showing the benefit of connecting oneself with an organization of this kind, he might tell them that five out of ten of the Presidents were now engineers and managers of fair-sized gas-works. He would therefore strongly recommend the younger members of the profession to join these Associations, where they would obtain instruction and information, and also have facilities for discussing their difficulties with their fellow-workers, and ascertaining the *modus operandi* followed in other works. Another consideration was the number of excursions arranged for, whereby the members could visit collieries or works directly concerned or in touch with the manufacture of gas. He wished all success to the Western District Association, and hoped that its prosperity might continue, not only in membership, but also in influence and culture. He wished them individually good luck and prosperity in their several callings.

Mr. T. Carmichael associated himself with the remarks of the President, and again thanked Mr. Masterton for his hospitality.

The party then returned to Edinburgh by special train.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The South Metropolitan Staff and Gas Testing.

SIR,—With two qualifications, I hold to-day the same beliefs as you have quoted of me from the year 1896 onward.

In 1904, I spoke of illuminating-power testing as then practised. The adoption of a rational burner has put it on quite a different basis.

I was too optimistic at the same time when I stated that incandescent lighting had *practically* killed all other forms of gas lighting. Only a fortnight ago, I went over a scientific instrument factory in South London where I found flat-flame burners were preferred to incandescent gas and incandescent electric lamps.

CHARLES CARPENTER.

South Metropolitan Gas Company,
Feb. 21, 1914.

Wanted an Educational Scheme.

SIR,—I have read with much interest the address given by Mr. F. J. Bywater at the annual dinner of the Midland Junior Gas Association, and your "editorial" on the above subject.

The proposal to ask the Council of the Institution of Gas Engineers to draw up a scheme will, I am sure, be favourably received by that body.

The enthusiastic spirit shown by the Junior Associations is greatly admired; and if the devotion of the members to their profession is directed into right channels, the industry will assuredly gain greatly in the future.

It is unfortunately true that there is a dearth of young men with certified qualifications as gas engineers. Quite recently inquiries were made for a suitable man to fill an important position; but none of the candidates were able to satisfy the requirements of the appointment.

The lesson to be drawn from this circumstance is, in my opinion, the importance and value of obtaining recognized qualifications. Membership of the Institution of Civil Engineers or the Institution of Mechanical Engineers is a recognition of ability which is highly prized; and our young men would do well to qualify by passing through the stages of studentship and associateship.

A degree of "Science" or "Engineering" may be obtained at the various Universities, and can be led up to by the way of Municipal Technical Classes.

These qualifications refer to theoretical knowledge. But at the present time the question of practical training in the various branches of engineering is receiving the attention of one of the Institutions with a view to making it a condition of membership.

In our own industry, there are the London City and Guilds Institute classes in "Gas Manufacture" and "Gas Supply;" and it appears to me that a certificate in the "Honours Grade" should be held by every young gas engineer who seeks to win a good position.

In conclusion, I would again express my sympathy with the suggestion made by Mr. Bywater and my sincere desire to assist in its promotion.

EDWARD ALLEN.

Liverpool, Feb. 20, 1914.

SIR,—The grateful thanks of all juniors are due to Mr. F. J. Bywater for his forceful indictment of a state of things over which they have brooded in helpless discontent for many years. Also to you, Sir, for your ready encouragement, and the generous measure of publicity you have accorded his valuable suggestions.

Following Mr. Bywater's address, Mr. E. W. Smith is reported to have said that "probably one of the biggest dangers that would have to be recognized was in the over-education of the junior members." This may mean many things. If Mr. Smith had in his mind the large number of juniors who, after spending several nights per week in study for six or seven years, find themselves possessed of a large and miscellaneous collection of technical certificates, and nothing else, then his observation is a strong argument for the creation of a systematized educational scheme.

Many a keen junior, upon the threshold of his career in the gas industry, anxiously studies the syllabuses of our Technical Colleges for guidance in the choice of those subjects that point the way to a better understanding of the theory of the operations into which his daily work provides practical insight. He is confronted by a legion of subjects which have a bearing on one department or another of the industry, and stands dismayed—lost in a forest of guide posts! In the words of Mr. Bywater, there must be provided "a something definite to work for," "a goal to aim at." Its present lack is the juniors' grievance; its creation, in addition to providing the remedy, would confer enduring benefit on them and, through them, upon the industry at large. Herein lies the key to the situation.

Necessarily, there must be much discussion before this ultimate goal is satisfactorily defined. I would like to suggest one solution, which is not without attractive features—namely, that membership of the Institution of Gas Engineers be the goal; but membership only to be gained by a stiff entrance degree. Why should there not be a "Gas Degree"? The mining and electric industries have their degrees; a plumber has the Sanitary Institute, a nuisance inspector the same, or the Diploma of Public Health. Cannot an industry employing 200 millions find use for a degree qualifying for its own special requirements? Are our juniors not worthy of that which minor industries have deemed essential? Patient juniors! let Mr. Bywater's words sink into you; your reward is long overdue.

This entrance examination could be modelled on that of the Institution of Civil Engineers; but on a more democratic basis—without its exclusive social and financial barriers. Shortly and roughly, the scheme would be as follows: The junior, aged sixteen or seventeen on his entry into any department of the gas industry, would have a graduated syllabus of the subjects, defined and approved by the Senior Institution in collaboration with our technical bodies, to study for (say) seven years—none too long a time when it is remembered that study is only possible out of working hours. At the end of this preparatory period, he would take the exam. entitling him to associate membership of the Institution of Gas Engineers. At this exam. a supplementary set of questions could be set in each department, to enable the student who has specialized to take honours in his choice—thus becoming "Associate Member of the Institution of Gas Engineers, Honours Manufacture" or "Honours Construction," &c. Within the next two years he must read a paper; and three years from the date of his election as associate member he would become eligible to be balloted for as a full member.

This solution has the advantage of requiring only the co-operation of existing bodies for its success. The ten years employment in the industry before full membership is gained would preclude the mere crammer; and it should not be difficult to provide an additional safeguard in some questions at the entrance exam., which the candidate *must* take, requiring empirical answers.

In course of time the majority of the members would be holders of the degree (always excepting those whose eminence in, and services to, the industry entitle them to election *causa honoris*), and this would enhance the prestige and authority of the Institution and remove the absurd anomalies which at present tend to lower its status.

I know many of the juniors have strong opinions on an educational scheme. Now is the time to air our grievances and opinions. The seniors are kindly disposed, and when one remembers the frequent paragraphs in their papers, bearing on the same subject, it is inconceivable that they would deny themselves the pleasure of conferring happiness and lasting benefit on those who are pluckily struggling, in a labyrinth of interminable byways, to gain the high road.

J. H. DARRAH.

Bramhall, Cheshire, Feb. 20, 1914.

Steam Raising by Gas Coke.

SIR,—Your note on the above is of considerable interest to me, and doubtless will be of considerable interest to all steam-users. The opinion held at present is that the use of coke damages the tubes of the boiler. I have not heard any very recent opinions on this; but it is well worth the while of the gas industry to investigate the statement, because if coke can be used for generating steam in electric supply stations, and provided it can be burnt in mechanical stokers, I would imagine that a very large business would result—probably to the benefit of both industries.

A. HUGH SEABROOK,
Borough of St. Marylebone Electric Supply.

York Place, Baker Street, W.,
Feb. 19, 1914.

[The point raised by our correspondent is of interest, and we are pleased to reply to it. There is such a large experience with water-tube boilers for steam-raising (using coke or coke breeze exclusively) on gas-works, that this experience alone should suffice to dispel any fears as to undue damage to the tubes by the coke. As a matter of fact, tube renewals are practically unknown. The destructive element in coal is the volatile sulphur as distinct from the fixed sulphur. In the coal-carbonizing process by which coke is produced, the former objectionable element is practically eliminated; but the percentage of fixed sulphur remains the same, and may even possibly be slightly increased. To most electrical engineers, the injurious effects of volatile sulphur on boiler-tubes and plates, furnace brickwork, and fire-bars are well known. Within knowledge is one important power-station where it was the usual practice to examine any tubes which had become weakened, bulged, or punctured, by cutting them across at the point of failure. While no evidence of internal corrosion could be detected, there was abundant proof of external erosion to account for the reduction of the metal. All bituminous coals contain volatile sulphur, which on heating is liberated and burnt, forming sulphurous acid gas, which attacks both metal and brickwork. Broken coke and coke breeze are being successfully fired on mechanical stokers of the sprinkler type (Vicars, Bennis, and others); while on the chain grate and underfeed coking type, mixtures of coke and coal are being fired with considerable commercial and practical advantage. We will in next week's "JOURNAL" give an illustration of a chain-grate mechanical stoker equipped for the burning of small coke or coke breeze, and will then refer to the benefit of mixing coke with coal fuel for boiler purposes.—ED. J.G.L.]

Surface-Workers' Pay in Northumberland.

SIR,—In your issue of the 17th inst., a paragraph appears intimating that the coal-owners of Northumberland have made an offer that the wages of surface-men between the ages of 21 and 65 should not be less than 3s. per day.

This is somewhat misleading as it stands; and it seems necessary to point out that this 3s. is what is known as a "basis" wage, and is subject to the addition of the county percentages arranged from time to time between the Owners' and Miners' Associations. The wages referred to are at present subject to the addition of 42 per cent., which makes the 3s. per day into 4s. 3·12d. per day. In addition to this money wage, the great majority of married persons are in receipt of either free houses or an allowance for rent in lieu thereof, and also to a supply of coal for use in their houses.

REGINALD GUTHRIE, Secretary,
Northumberland Coal-Owners' Association.

Newcastle-upon-Tyne, Feb. 21, 1914.

"Inappropriate Remarks."

SIR,—Your word "inappropriate" [see last issue, p. 447] is surely more "inappropriate" in its application. There are other words in the dictionary beginning with "in," "im," or "ig," which would have been more correct to apply in any criticism of the remarks.

Is Mr. Chester Jones prepared to keep, and undertake the further

or finishing education of, his parlourmaid or orderly, should she or he have succeeded in breaking open his locked drawers or in searching his pockets for money which he might have put there to tempt her or him, but really to pay his tram fare or his gas bill?

I fear Mr. Chester Jones's personal opinion as publicly expressed to an east-end gathering of admirers in his Court is more likely to encourage the senior criminals with their junior assistants not only in the east end of London but elsewhere in their depredations, and may have a widely-spread baleful influence on those democrats who, unable or unwilling to discriminate between right and wrong, in the end find themselves in the Police Courts in front of their own familiar friends.

Mr. Chester Jones's personal opinion, although unasked, may be good for the Police Court; but it does not meet with the approval of those of his seniors who know better. What does the Gas Company say?

Feb. 21, 1914. A STOCKHOLDER.

Alliance and Dublin Gas Company.

SIR,—In common with other stockholders, I have received letters dated Sept. 27, 1913, and Feb. 12, 1914, from Mr. F. J. Dickens, and now anxiously await the result of the investigation instituted by him.

I feel sure that many in London and the South applaud Mr. Dickens and his Committee for their splendid action, and fervently hope that lasting good will ultimately be the outcome.

Naturally, I have meanwhile refrained from continuing my reviews of the undertaking. Nevertheless, although I am prepared to support the Lancashire Committee with my proxy, I have preserved my independence to continue criticisms later, should it be advisable or necessary.

Feb. 21, 1914. NONULUS.

Gas and Electric Lighting and Cooking.

At a local meeting last week of the Wolverhampton and District Engineering Society two subjects were brought under discussion—"Electricity *v.* Gas," delivered as a presidential address by Mr. E. C. Shawfield, and a paper on "The Cooking Problem: Why Electricity is Winning," by Mr. F. S. Grogan. The President said it was possible to supply electrice light cheaper than gas; and he claimed that in a short time it was probable that the cost would be further reduced. He thought an adequate supply of electricity in Wolverhampton for all purposes could be provided at a cost not exceeding 1d. per unit, if the Electricity Committee would take a wide view of the question, and not devote the whole of their profit to the reduction of the rates. At the same time, gas had a commercial value; and it was doubtful whether the cut-throat policy of competition was beneficial beyond a certain limit. Was it not possible that the present parliamentary restrictions on gas companies might be removed, so as to enable them to supply, not an illuminating gas (which was not required), but a heating gas which could be furnished at a much less cost than at present? While he was an ardent believer not only in the possibilities, but in the certainty of electricity proving the best medium for lighting and motive power, he wanted all present to consider whether it was not better for the two concerns, instead of fighting one another, to each take the field in which it could best serve the community. Mr. S. T. Allen (the Wolverhampton Borough Electrical Engineer) thought the opposition to electric cooking was a healthy sign, because it was a measure of the utility of the new method; the opposition coming only from those interested in gas undertakings and other sources of supply. Mr. H. H. Creasey (on behalf of the British Commercial Gas Association) contended that, while electricity had made great progress, so had the gas industry. He added that the price of lighting by electricity was double that of gas illumination.

Complaints of Electric Lighting.—At a meeting of the Belturbet Urban Council, Mr. John Small complained of the system of electric lighting which had been introduced in the town, and said if the ratepayers did not get a better service, the Council should revert to the "old illuminant," which seemed to be more reliable, after all. It was only natural, he added, that when people were paying for light, they should get it; but they were not getting it now. Sometimes they had no light at all.

Fatal Result of a Gas Explosion.—An escape of gas having been noticed in a small house at Silvertown, East London, a Mr. Wharton, who lived opposite, was asked to put the matter right. After he had done so, a match was struck by someone, and an accumulation of gas exploded. At the time, Mr. Wharton's little son was watching his father from the street; and he was killed by the force of the explosion. Another lad and the wife of the tenant of the house, as well as Mr. Wharton, suffered from burns and shock.

Domestic Lighting Fifty Years Ago.—The last number of the "Builder" contains the following extract from an article on "The New Light," in that publication for Feb. 20, 1864: "Of late, in provincial towns, and even in some villages, gas lights have been introduced into the dwellings of the working classes—a practice which adds to the cheerfulness of homes and is not more expensive than candles. In Manchester most new houses, of even the third class, have gas-pipes laid on at the time of building. In London this is not so generally done, even in new houses of this class; and to lay the pipes to old ones, by reopening the pavements, is a seldom recurring art. Of late, however, lamps constructed for the use of paraffin or petroleum and colza oils are coming much into use in the houses of the working classes; and it is stated that in the longest days of winter, when light is needed from between four and five o'clock p m. till between ten and eleven, and also in the morning, the cost is only about 8d. a week. Common candles would come to about a shilling; while the paraffin gives three or four times the volume of light that could be obtained from candles for that money." The Editor appends the following note: "We wonder if, with the progress of inventions, we shall be discussing a 'new light' in fifty years' time."

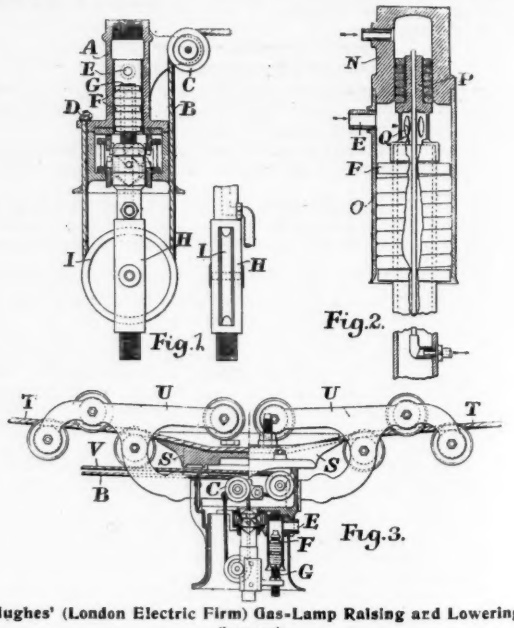
REGISTER OF PATENTS.

Supporting Gas-Lamps.

HUGHES, G. A., of Croydon.

No. 1785; Jan. 22, 1913.

This gear is for raising and lowering gas-lamps with devices for making and breaking joint between co-operating members by the act of moving the lamp into and out of a predetermined position. By means of the attachment the lamp may be directly raised into position without having (as is usual) to be raised above the connecting device, and then lowered on to it.



Hughes' (London Electric Firm) Gas-Lamp Raising and Lowering Supports.

Fig. 1 shows one form of the device, with a fragmentary view of a portion of it in side elevation. Fig. 2 shows a modified arrangement. Fig. 3 shows the arrangement assembled and suspended in position on a span wire.

The cylinder A is carried by a bracket, span wire, or other device from which the lamp is to be suspended; the lifting rope B for the lamp passing over a pulley C mounted on the chamber frame and attached to a fixed point upon it as at D, in such a manner that the hoisting of the lamp may be carried out centrally in relation to the casing. The gas supply is led through a port E and passes through a hollow piston rod or plunger G, carried by a piston F, adapted to work within the cylinder A—the plunger being secured to, or formed integral with, a stirrup H to which the lamp is connected, and which carries a pulley I or similar anti-friction device round which the hoisting rope is adapted to pass.

Fig. 2 illustrates an arrangement intended for use with lamps fitted with a pilot light, and so requiring more than one supply of gas. In it, two chambers N O are employed, in one of which the plunger F is adapted to work, while a second piston P works slidably within the chamber N. The lower piston is fitted with a hollow rod to which the gas is supplied through ports Q, while the pilot system is controlled from the chamber N—the gas being supplied to the pilot light by a tube passing up through the two plungers.

When applying the invention to a span wire suspension system as in fig. 3, the fixed parts of the device, comprising the cylinder and ratchet collar, may be carried by a body portion S secured to the span wire T; while the movable portions (comprising the piston, ratchet, and stirrup) are suspended from the usual trolley U, to which is attached the traversing rope V—the lifting and traversing ropes being adapted to be operated by separate winches or by the same one.

Obtaining a Useful Bye-Product from Gas Manufacture and the Recovery or Utilization of Ammonia from Gas Manufacture.

LYMN, A. H., of Queen Anne's Chambers, Westminster.

No. 1851; Jan. 22, 1913.

This invention has for its object (besides providing a useful and lucrative mode of recovering or utilizing ammonia) to obtain at slight cost a substance doubly valuable as a fertilizer—namely, ammonium nitrate or nitrite or both; "these substances being doubly valuable as fertilizers because they contain nitrogen in their acid radical as well as in their base."

Ammonium nitrate is at present employed, the patentee remarks, principally as a component part of explosives, and ammonium nitrites may also be employed in the same manner. For this purpose these salts must be obtained in a very pure condition. When intended for use as a fertilizer, however, they need not be pure; "although, on the other hand, it is not to be supposed that the present invention is restricted to the production of impure products."

The ammonia in the gas is brought into contact with nitrogen oxides

or oxyacids obtained by combustion of gas which has already been freed from ammonia with nitrogen and oxygen. The ammonium nitrate or nitrite is thus obtained as a bye-product, as, for instance, by the direct absorption of ammonia. The combustion of the gas "may be effected under pressure, or in any suitable way, to obtain by the oxidation of the nitrogen contained therein or added thereto by means of oxygen contained therein or added thereto, oxides of nitrogen, which before or after condensation to nitric acid or nitrous acid are brought into contact with the ammonia, which last may either be contained in the gas or may have been already recovered from the gas, in its uncombined form."

In one method of applying the invention to the recovery of ammonia from gas producer plants, the gas leaving the producer or superheater is, after having been freed from the bulk of its dust by dry separation, washing, or otherwise, passed in a hot state—say, at a temperature between 50° and 90° C.—into an ammonia absorbing apparatus, in which it is brought into intimate contact with an ammonium nitrate or nitrite solution or liquor containing nitrogen oxides or oxyacids, or both, produced as a further bye-product in the manner described. Such nitrogen oxides or oxyacids may be introduced in any suitable manner into the liquor or solution, or the liquor or solution may be utilized to wash the nitrogen oxides or oxyacids out of the gases leaving the nitric acid plant. This latter method of introducing the acid into the liquor or solution has the advantage, it is said, that it obviates, to a large extent, the bulky condensing towers or other apparatus generally used to condense the acid in the usual manner.

The producer gases, after having passed through the ammonia absorbing apparatus and after having been freed from ammonia, may be caused to enter gas washing and cooling apparatus, by means of which they are freed from tar and other impurities. The producer gases are then divided into two portions, one of which is used, as described, to produce the nitric or nitrous acid for absorbing the ammonia, while the other portion is utilized "for any other desired purposes—for instance, for power production or for furnace firing."

A method of applying the invention to other combustible gases—such as distillation gases from coal—may consist in bringing the whole of the gas at a suitable point of the process, before or after purification, into contact with nitric or nitrous acid in a saturator or in an apparatus such as a tower, or with a liquor-solution of ammonium nitrate or nitrite containing nitrogen oxides or oxyacids—the nitric or nitrous acid or the nitrogen oxides being obtained as already described.

Inverted Gas-Lamps.

REDLHAMMER BROS., and HERRMANN, T., of Gablonz a/Neisse, Bohemia.

No. 2006; Jan. 24, 1913.

This invention relating to inverted gas-lamps consists in making the central burner tube of ceramic ware, and forming a tight joint for the chimney by abutting the top edge of it against a second flange, or by providing the underside of the single flange with an annular plate having recesses corresponding with those in the flange, and which plate can be turned to effect a tight joint.

Cooling, Cleaning, and Drying Gases.

WOLLASTON, T. R., of Manchester.

No. 2114; Jan. 27, 1913.

This apparatus is of the kind in which the gas is treated with cooling and washing liquid, in the form of jets or spray, in a vertical chamber or column which diverges towards the base and delivers on to the surface of the liquid in a lute or receptacle below. The apparatus is intended principally for cooling and washing the gases delivered from retorts, coke-ovens, and furnaces, and (when necessary) for subsequently scrubbing and drying the gas after washing.

The apparatus may be thus generally described: The hot and impure gas enters at the top A of a central vertical chamber B, conical in shape, and at or near the apex are introduced (in a downward direction) finely-divided liquid sprays C under considerable head. As the gas travels down the increasing chamber B, its velocity is reduced, "but heavy entrained particles, by reason of their momentum, retain some of their initial velocity and tend to 'race' the gas and to fall to the bottom into a suitable lute D." The lower edge of the chamber B, terminating some small distance above the level in the lute, is provided with comb edging E; the prongs of the comb being fluted or so prepared that their points dip below the surface of liquid in the lute and form channels for draining into the lute, while the spaces between the prongs allow the cooled and washed gas to escape radially.

Surrounding the central chamber is a cylindrical shell F with cover, so as to form an enclosed annular chamber of considerable size, and the lower edge of which dips into the lute D. On a stage K within the annular chamber is mounted, for filtering or drying, a bed of fibrous or granular material in a cage; or, alternatively, there is a dryer consisting of radially disposed and closely spaced thin metallic plates L.

The radial plates may be formed of corrugated metal sheets with the corrugations arranged vertically and with wings R punched out as described in patent No. 6478 of 1901. Or they may be plain non-corrugated plates with wings punched in like manner and curved and disposed in plan like the blades of a pressure fan or blower, so as to cause the gases passing between them to take an indirect course.

In one arrangement, the gases pass from the comb-shaped lower edge of the central chamber radially outwards under the supporting stage, and then flow upwards and radially inwards through the drying device, finding final exit through an outlet branch O in the cover of the outer casing. In another arrangement, the gases pass from the combed lower edge of the central chamber directly upwards, and then turn outwards to pass radially through the drying device, finding final exit through an outlet branch near the periphery.

Distillation of Carbonaceous Material.

HILLS, H. G., of Manchester, and THOM, R. W., of Southport.

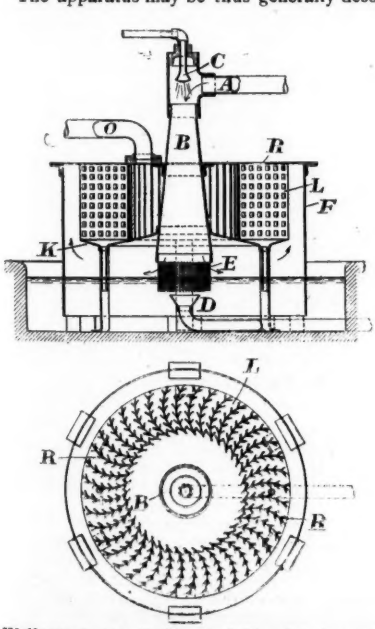
No. 3284; Feb. 8, 1913.

This invention has for its object the distillation of coal or other carbonaceous material in such manner that the highest possible quantity of bye-products is obtained in the form of tar, benzol, ammonia, &c., together with a coke of even composition, which can be hard or soft according to the purpose for which it is required. In their process, the patentees remark, the production of a large quantity of gas is not considered of so much importance as the quality of the coke and the quantity and quality of the bye-products.

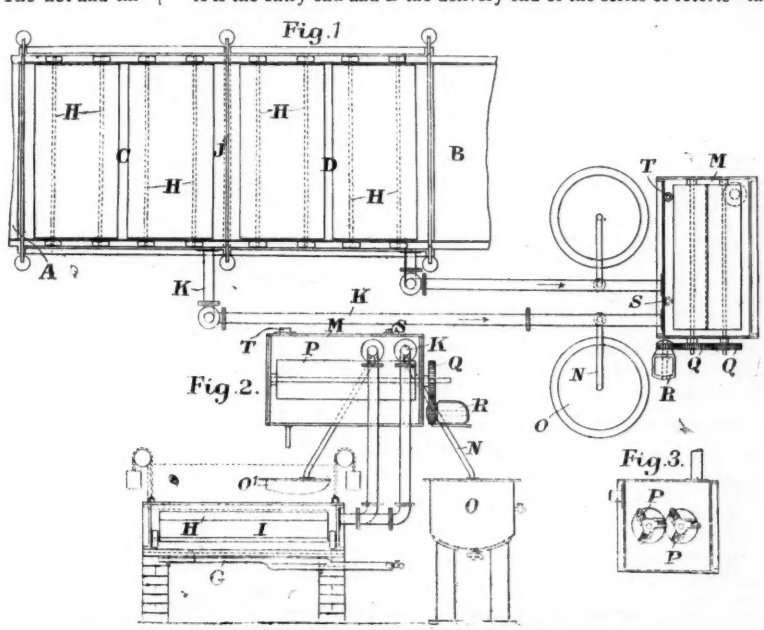
They propose to provide a retort or oven, externally heated and made to exclude air, into which is inserted any number of trays containing the material to be distilled in thin layers. So soon as the trays are inserted the retort door is closed, and the air contained in it is exhausted. The distillation is then started at a low temperature; and the heat is regulated so that distillation is effected in successive stages at different temperatures, and the distillates collected in separate tar tanks or receivers. If the coke is to be of a free-burning nature, the maximum temperature is kept comparatively low. If, on the other hand, hard coke is required, the maximum temperature is raised suitably after the lighter hydrocarbons have been given off, when the heavier hydrocarbons will be distilled and "leave the coke theoretically free from volatile matter." The trays are then withdrawn, and the operation is completed. This intermittent system, it is said, distinguishes the process from one in which a conveyor is used, as in that case the material is being continually fed into the distilling chamber.

Fig. 1 is a plan of carbonizing plant comprising a series of retorts, bye-product tanks, and gas-washing cistern arranged for the purposes of the invention; fig. 2 is an end elevation; and fig. 3, a sectional end elevation showing the beaters and the gas-washing cistern.

A is the entry end and B the delivery end of the series of retorts—in



Wollaston's Gas Cooling and Cleaning Apparatus.



Hills and Thom's Coal Distillation Plant.

this case, two retorts C D. They are made air-tight and externally heated (say) by a series of bunsen burners G. Each of the trays H (of which four are shown) is formed with, or laid upon, a truck I, to be run into and out of the furnaces. The retort C (supposed to be kept at a comparatively low temperature) is divided by a movable plate J from the retort D, which is maintained at a higher temperature for the purpose of expelling the heavier hydrocarbons and completing the distillation. The more volatile bye-products are expelled from the material in thin layers on the trays in the retort C and conducted, through the pipe K, to the gas-washing cistern M; the tar and like impurities being drained off through the branch pipe N into the tar-tank O. In like manner the heavier hydrocarbons are conducted from the partially carbonized material on the trucks in the retort D to the gas-washing cistern M, the remaining tar and like heavy impurities being drained off into the tar-tank.

The gas washer or scrubber, in the example illustrated, consists of a cistern containing two beaters or scrubbers P driven by suitable gearing Q actuated from a motor R, and supplied with water through a pipe S. After having been washed and scrubbed, the purified gases are discharged through a pipe T.

Operating Gas-Valves and the Like.

HORSTMANN, G. O. H., E. H., A., and S. A., and EDGAR, W. T., of Bath.

No. 2588; Jan. 31, 1913.

This invention relates to mechanism in which a 24-hour dial is driven from or by a going barrel of clockwork mechanism (patent No. 23,161, of 1909 being an example), in which the winding is effected by rotating the central arbor. It has for its object an improved construction and arrangement of apparatus "whereby there obtains a considerable diminution in the diameter of the apparatus, while retaining the large-sized mainspring box or barrel which is an essential to the effective working of clockwork mechanism for lengthy periods with once winding."

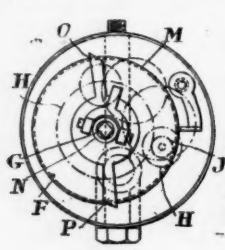


Fig. 1.

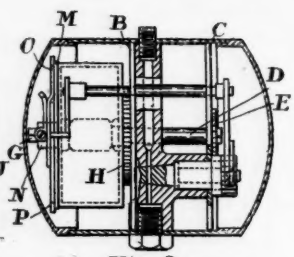


Fig. 2.

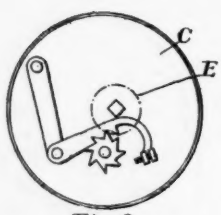


Fig. 3.

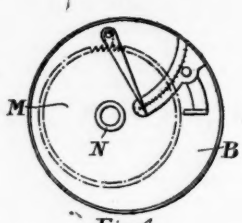


Fig. 4.

Horstmann and Edgar's Clockwork Gas-Valve Operator.

Fig. 1 is a front elevation with the cover removed, Fig. 2 is a longitudinal sectional view with certain parts removed for the sake of clearness, Fig. 3 is a rear elevation showing the ratchet actuation of the gas-plug. Fig. 4 is a front elevation showing the minute recorder.

There is provided within the cylindrical casing a pair of plates B C, between which is mounted the going train, terminating in a watch escapement. In the centre of the plates is pivotally mounted the spindle or barrel winding arbor D, which, at the rear end, is provided with a ratchet wheel E. The arbor extends from the front plate B so as to carry the going barrel F, which is pivotally supported and retained on the arbor, which, at its front end, terminates in a winding square G. The barrel is provided at the back with a main and toothed wheel H, communicating power to the going train through the medium of the pinion J of the first wheel K of the train.

The attachment of the 24-hour dial M to the going barrel F, so as to be relatively adjustable thereto, is by means of a hollow boss N protruding from the extreme front of the barrel and carrying the dial either by means of a sleeve rigidly attached to it and also carrying the tappets as described in the 1909 patent; or else the dial M and the tappets O and P may be independent of one another and rotatably mounted on the boss—dished springs being interposed for frictional adjustment and the whole rigidly secured to the barrel in the position shown in fig. 2.

Constructing Furnace Roofs and Walls Built of Brickwork Liable to Shrink in Heat.

MARKS, E. C. R. A communication from Veitscher Magnesitwerke Aktien-Gesellschaft, of Vienna.

No. 8959; April 16, 1913.

The patentees claim to have discovered that furnace walls—even when in direct contact with fire gases—and even the vault or roof of a furnace, may be "durably and satisfactorily made of magnesite bricks by the incorporation with the mortar between the bricks of materials, which form slag in heat with the mortar or with the bricks, or with both, with an increase in volume, in such a manner as to counteract the injurious effects of the shrinkage of the mortar and of the bricks," They have also discovered that "excellent results are obtained by inserting pieces of iron or other difficultly fusible metal in the mortar, or by mixing such metal in a subdivided form, such as turnings, mill scale, forge scale, with the mortar."

The mortar employed for the magnesite bricks consists of sintered magnesite or other fire-resisting material, poor in silicon; and the mortar is mixed with the iron additions as insertions with the aid of an addition of a suitable binding material—tar, lime-milk and the like in the following percentage proportions: 77 of magnesite powder, 3 of lime dust, 20 of water. The proportion of the mortar and iron to be added for the joints between the bricks is approximately as follows: 25 per cent. by weight of mortar, and 75 per cent. by weight of iron.

In carrying out the invention, it is also advisable to provide the surfaces of the furnace wall or roof facing the fire with a coat of fire-resisting mortar, with which materials are mixed which form slag with the bricks in the heat. This protective coating may have the following average proportions of mortar to metal: 85 per cent. of mortar, 15 per cent. of iron.

The primary object of this fire-resisting coat is to protect the interstitial mortar which is provided with the slag-forming material from outside influences until the material has formed a slag with the mortar or bricks. This coat further forms a protection for the ends or faces of the bricks.

In order to hold the coating firmly in place, thin metallic rods, thin plates or sheets, wire netting, or the like, are embedded in the mortar between the bricks, so that they project beyond the joints on the side exposed to the fire. Also, in the case of the roof, to construct the latter of specially shaped bricks having, or forming, projections and recesses, holes, or grooves for the same purpose.

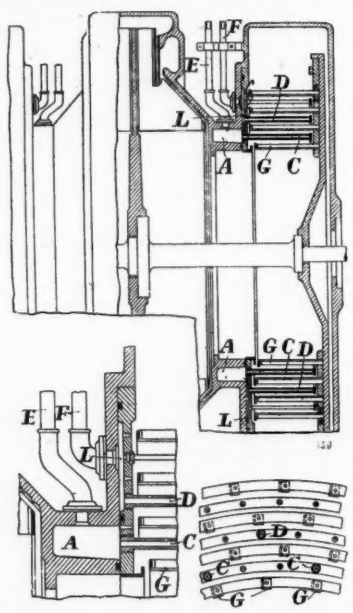
In the heat the metallic insertions and the finely-divided metallic particles form a slag with the bricks and the mortar constituents, with considerable increase in volume, and thereby the shrinking of the mortar in the interstices, and also of the bricks, is counteracted, "and the fire-resisting coat combines firmly with the bricks on their faces which are exposed to the fire." The crust formed by the coat on the fire-exposed surfaces of the roof or walls is said to be somewhat less fire-resisting than the magnesite bricks; so that the crust forms a closely adhering cohesive coat, which, being decidedly basic, does not attack the bricks.

Washing, Purifying, and Cooling Gases.

THEISEN, H. E., of Munich.

No. 21,427; Sept. 23, 1913.

This invention relates to atomizing apparatus for purifying, cooling, and mixing gases, of the type in which the gas flows past partly fixed and partly rotating atomizing surfaces, or past oppositely rotating atomizing surfaces, and more particularly to the kind in which the partly fixed and partly rotating atomizing surfaces and perforated plates or wire cloth cylinders are cast on rings inserted in the apparatus, or secured to rings in such manner that, when being put together and taken apart, the upper half of the casing and the atomizing surfaces may be inserted and withdrawn from above.



Theisen's Washer, Purifier, and Cooler.

A sectional elevation of the apparatus is given; also an enlarged view of part of it, and an end elevation of part of the atomizing bars.

For a general description of the operation of atomizers of the type in question, the inventor refers to his prior patents, No. 27,696 of 1911 and No. 27,417 of 1912.

The apparatus now shown by way of example consists of a fixed outer casing containing removable annular discs carrying water injection tubes (the special disposition of which will be described later). There is a series of rotating disintegrator bars G, the particular disposition of which forms part of the present invention. The water supply tubes are fixed, while the disintegrator bars rotate. The water-injecting apparatus—for example the pipes C—is so arranged on the annular disc which carries the atomizing surfaces and covers inter-

nally a water supply passage A that, when the atomizing device is removed, the pipes C are removed with it.

The arrangement described may be adopted in atomizing or disintegrator gas-purifiers of any kind—more particularly where the washing water and the gas are passed through the apparatus either in the same direction or in opposite directions one to the other. When the gas is passed through the atomizing device from the outside to the inside—that is to say, in a counter-current to the washing water—as, for example, in the form here shown—a large part of the washing water introduced from the inside through the pipes C is carried inwards by the gas. The consequence is that in the outer part of the atomizing device the gas is not mixed, or only to a small extent, with the washing water.

This disadvantage is overcome by arranging further injection pipes D inside the rotating disintegrator or atomizer cylinders, which are concentrical one in the other, and on the annular disc (in addition to the water injection pipes C), so that, by means of the pipes D, water can also be introduced into the outer layers.

The injection pipes are preferably arranged between the atomizing bars in such a way that the water injection pipes alternate with a larger number of bars. For example, water may be introduced to the annular passage A and to the pipes C by a water-pipe E, and may pass from the channel A, if desired, through radial passages into the annular chamber L behind the annular disc. The supply of water to the pipes D may also, if desired, be effected by means of a separate pipe F, so that by shutting off and turning on the pipe E or the pipe F the mixture with water may be suitably regulated.

Manufacture of Hydrocyanic Acid.

FABRIQUES DE PRODUITS CHIMIQUES DE THANN ET DE MULHOUSE, of Thann, Germany, the SOUTH METROPOLITAN GAS COMPANY, of London, and FREYSS, G., Ph.D., of Nancy, France.

No. 18,168; Aug. 9, 1913.

This invention relates to the utilization of the sludges obtained by the washing of crude coal gas by solutions of ferrous sulphate, with a view to the manufacture of pure hydrocyanic acid.

The reactions involved in the invention are said to be well known, and the patentees say they are aware that it has already been proposed to add ammonium sulphate or chloride or other ammonium salt to the liquor from ammonia stills containing calcium ferrocyanide, so as to obtain an insoluble double compound which is subsequently to be worked up into marketable ferrocyanide or other useful products. It is also known to distil calcium potassium ferrocyanide and similar compounds with sulphuric acid for obtaining hydrocyanic acid. Their invention, however, resides in the combination of the processes referred to, as set out in their claim, which is as follows:

"A process for the manufacture of hydrocyanic acid from the solutions obtained by boiling with lime the sludges resulting from the washing of crude coal gas in solutions of ferrous sulphate, wherein the solutions are treated with an ammonium salt of such composition that the precipitate formed shall consist either of a mixture of pure calcium ammonium ferrocyanide and a pure calcium salt, the acid radical of which is non-volatile and stable to the action of dilute sulphuric acid, or of pure calcium ammonium ferrocyanide only, and the utilization of the mixture of salts or the calcium ammonium ferrocyanide alone for the production of pure hydrocyanic acid with the formation of a mixture of ferrous ammonium ferrocyanide and calcium sulphate, capable of being again utilized for the same purpose and by the same processes, in the course of which the operations of filtration and washing out can all be performed rapidly and without any practical difficulty."

Quenching Coke.

BERLIN-ANHALTISCHE MASCHINENBAU-AKTIEN-GESELLSCHAFT, of Berlin.

No. 23,555; Oct. 17, 1913. Convention date, Oct. 6, 1913.

This invention relates to apparatus for quenching coke (mainly for coke-ovens) as described in patent No. 9269 of 1912.

In the apparatus then described, the sides of the coke-tank provided with overflows only came into direct contact with the quenching liquid when, during deeper immersion of the coke tank, the liquid had passed into pocket-like chambers formed by the overflows. But, according to the present invention, all the parts of the walls of the coke-tank below the level of the quenching liquid come into immediate contact with it directly the charging of the coke-tank commences, and are "cooled in an efficient manner."

To this end the coke quenching apparatus is modified by omitting the pocket-like chambers, so that, on the immersion of the coke-tank, the quenching liquid can directly enter its bottom conduit through lateral openings as soon as the valves controlling these openings have been automatically opened by striking stops. The lateral openings of the bottom conduit are at the same time intended to discharge the excess of quenching liquid on the coke-tank being raised after the quenching is completed.

Gas-Meters.

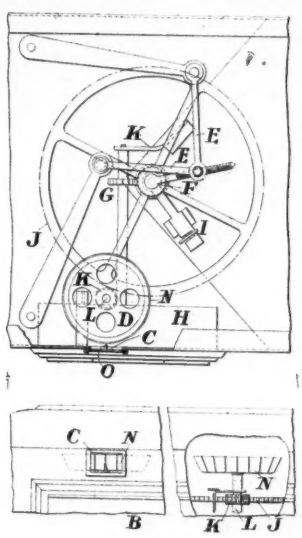
WRIGHT, A. C., of Witton, and FROST, A. C., of Four Oaks, Warwickshire.

No. 24,571; Oct. 29, 1913.

This gas-meter leakage-indicating device is of the kind which is operated by the crank-shaft that is actuated by the meter diaphragm or bellows and in turn drives the usual consumption registering mechanism, and which comprises an indicating member that moves past an aperture in the meter casing in the neighbourhood of the consumption register dials.

The illustration shows a plan of a gas-meter with the cover removed; a part front elevation of the indicator mechanism behind the front cover; and a front view.

B is the hinged dial-cover of an ordinary consumption register; and C an aperture in the wall of the casing past which the indicator D of the leakage-indicating device is adapted to travel. E are parts (of known construction) actuated by the measuring chamber bellows or diaphragms, and adapted to turn the crank-shaft F driving the consumption register mechanism gears G mounted in the framing H, which is secured to the wall of the casing. Rotation of the crank-arm in the non-registering direction is prevented by the device I of any suitable construction.



Wright and Frost's Gas-Meter Leakage Indicator.

The leakage-indicating mechanism comprises a toothed wheel J secured to the end of the crank shaft F (so as to turn with it), and meshing with a smaller toothed wheel K fixed to a spindle L rotatably mounted in a bracket secured to the framing H, and, if desirable, to the casing also. The spindle L carries at its upper end a circular disc or equivalent member N, which serves as the leakage indicator and is of such a diameter that its perimeter will travel in close proximity to the aperture C as the spindle L turns by reason of a movement of the crank-shaft F, owing to a consumption or a leakage of gas on the consumer's side of the meter.

The diameters of the wheels J and K are so proportioned that, when leakage occurs, "the drum N will move sufficiently fast for its movement to be easily observed, and the leakage accordingly is detected."

APPLICATIONS FOR LETTERS PATENT.

3314.—RUSSELL, J., AND CO., LTD., and REASON, H. L., "Ball joints for gas-lamps." Feb. 9.
3346.—SCHUBERT, O., and BERGMANN, A., "Dry meters." Feb. 9.
3347.—TAYLOR, C. F., "Gas safety-valve." Feb. 9.
3363.—WOODALL, H. W., "Heating retorts, &c." Feb. 9.
3384.—JENSEN, C. A., "Gas-igniting devices." A communication from B. Jeidel. Feb. 9.
3401.—HAY, W. G., "Centrifugal gas forcing apparatus." Feb. 10.
3432.—RUTTEN, J., "Controlling gas-valves." Feb. 10.
3433.—FLEISCHER, J., "Gas-radiators." Feb. 10.
3475.—GUEUX, J. J. M., "Controlling flow of fluids." Feb. 10.
3480.—MELLIN, M. L., "Measuring temperature." Feb. 10.
3550.—COLBRAN, J. B., "Controlling burners." Feb. 11.
3637.—ANTROBUS, W., "Treating fuels for obtaining bye-products." Feb. 12.
3850.—WALKER, G. A., "Ball-joints for gas-fittings." Feb. 14.
3866.—BÜNTE AND REMMLER, "Inverted gas-lamps." Feb. 14.
3884.—WELSBACH LIGHT CO., LTD., and BARK, B., "Shaping and seasoning mantles." Feb. 14.
3885.—NIES, E., "Testing gases." Feb. 14.
3886.—COCHRANE, B., and PEEL, R., "Vertical coking-retorts or carbonizing chambers." Feb. 14.
3898.—BRITTON, J. W., and the GAS-METER COMPANY, LTD., "Gas-meters." Feb. 14.
3904.—PRESTAGE, E., "Gas-compressors." Feb. 14.

A Gas Stoker's Death at Chichester.—The death of a stoker named Bridger, who had been employed for over twenty years at the Chichester Gas-Works, formed the subject of a coroner's inquiry last week. The widow stated that deceased had told her he had slipped while wheeling a barrow on a plank in the retort-house, and fell with one foot under him; aud that after re-starting work he was compelled to return home. The retort-house foreman also said Bridger had told him of the accident, and complained of his foot being so swollen that he could hardly get about. In reply to Mr. C. B. Roos, he stated that another man had had a similar accident. The medical evidence was to the effect that Bridger entered the hospital; and there it was found that his condition was due to natural causes, and had nothing to do with the accident. The Jury returned a verdict to this effect.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read the second time and committed: Abertillery and District Water Board; Cleckheaton Urban District Council; Ellesmere Port and Whitby Urban District Council; Llanfaelog Water; Mexborough Urban District Council; Newport Corporation; Porthcawl Urban District Council; Reading Corporation; Weston-super-Mare Urban District Council.

Petitions have been presented against the following Bills:—

Abertillery Water Board, by John Lloyd and William Reginald Herbert; John Capel Hanbury.

Brentford Gas, by the Wandsworth and Hammersmith Borough Councils; Richmond (Surrey) Corporation; Great Western Railway Company; Feltham Urban District Council; Port of London Authority; London County Council; Metropolitan Water Board; Twickenham, Sunbury-on-Thames, Barnes, Chiswick, Heston and Isleworth, and Staines Urban District Councils; Metropolitan and Brentford Electric Supply Companies; Uxbridge Gas Company; Ernest Greenwood and others.

Bristol Water, by the Bristol Corporation.

British Gas Company (Hull Station), by the Kingston-upon-Hull Corporation.

Chelmsford Gas, by the Chelmsford Corporation; Glover and Hobson, Limited.

Cleckheaton Urban District Council, by the Bradford Corporation; London and North Western Railway Company; West Riding County Council; Lancashire and Yorkshire Railway Company.

Edenbridge Gas, by the Sevenoaks Rural District Council; Owners, lessees, and occupiers of dwelling-houses and inhabitants in Edenbridge; Arthur Hepburn Hastie and another.

Ellesmere Port and Whitby Urban District Council, by the Chester United Gas Company; Cheshire County Council; London and North Western and Great Western Railway Companies; Sutton and Hooton Gas Company; West Cheshire Water Company; Shropshire Union Railways and Canal Company.

Gas Light and Coke Company, by the East and West Ham Corporations; Leyton, Ilford, and Willesden Urban District Councils; London Corporation; London County Council.

Hightown Gas and Electricity, by the Liverpool Corporation; Rebecca Jane Gregg; Owners, lessees, and occupiers.

Leighton Buzzard Gas, by the Grand Junction Canal Company; Leighton Buzzard Urban District Council; London and North Western Railway Company.

Liverpool Gas Company, by the Bootle Corporation; London and North Western Railway Company; Seaforth and Sefton Junction Railway Company; Waterloo-with-Seaforth Urban District Council; Liverpool Corporation and Mersey Docks and Harbour Board; Lancashire County Council.

Llanfaelog Water, by Eric James Walter Platt; Sir George Meyrick; Thomas Williams and others; London and North Western Railway Company; Holyhead Water Company.

Longwood and Slaithwaite Gas, by the Huddersfield Corporation; Golcar Urban District Council.

Manchester Corporation, by the Trustees of the Lord Egerton of Tatton; Patrons, Rector, and Churchwardens of St. Mary's Church, Hulme, Manchester; Ashton-upon-Mersey and Sale Urban District Councils; Cheshire County Council; Trafford Power and Light Supply (1902), Limited (against alteration); Altrincham, Failsworth, Stretford, and Prestwich Urban District Councils; Oldham and Stockport Corporations; London and North Western Railway Company; Manchester Commercial Buildings Company, Limited, and others; Cheshire Lines Committee; Owners and occupiers of premises in Trafford Park; Producers Petroleum Company; Owners, &c., of buildings and premises abutting on Cross Street, Chapel Walks, and Cheapside, and ratepayers in the City of Manchester; Salford Corporation; Stretford Gas Company; Great Northern, Lancashire and Yorkshire, and Great Central Railway Companies; Guardian Assurance Company; Radcliffe and Pilkington Gas Company; Burton-upon-Towell and Bucklow Urban District Councils; Lancashire County Council.

Mexborough Urban District Council, by the Mexborough and District Water Company.

Mexborough Water, by the Mexborough Urban District Council.

Newport Corporation, by the Newport (Mon.) Gas Company; Great Western Railway Company; South Wales Electrical Power Distribution Company; Lord Tredegar; St. Melons Rural District Council.

Porthcawl Urban District Council, by the Great Western Railway Company; Colonel Raleigh Grey and others; Porthcawl and District Gas Company; Barry Sand and Gravel Company.

Reading Corporation, by the Reading Electric Supply Company; Great Western Railway Company; Conservators of the River Thames; Tilehurst, Pangbourne, and District Water Company; South Eastern Railway and South Eastern and Chatham Railway Companies' Managing Committee.

Rhymney and Aber Valleys Gas and Water, by the Gellygaer Urban District Council.

Skegness Gas, by the Skegness Urban District Council; Great Northern Railway Company.

Skegness Urban District Council, by the Skegness Gas Company; William Bradley, junr., and others; Great Northern Railway Company.

South Bank and Normanby Gas Company, by the Middlesbrough Corporation.

Stone Gas and Electricity, by the Staffordshire County Council; Stone Urban District Council.

West Gloucestershire Water, by the Thornbury, Keynsham, Warmley, and Chitton Rural District Councils; Great Western Railway Company; Sir George Holford; Gloucestershire County Council.

Weston-super-Mare Urban District Council, by the Weston-super-Mare Hotel, Limited; Burnham Urban District Council; Inhabitant ratepayers, owners, lessees, and occupiers of lands, houses, and property in the parishes of Banwell, Puxton, Wick, St. Lawrence, Congresbury, and Worle, in the County of Somerset, and of the Rural District Council of Axbridge; Trustees of the Bristol Municipal Charities; John M. Williams and others; Commissioners of Sewers for the County of Somerset; Great Western Railway; Ecclesiastical Commissioners for England; Estates Governors of Colston Hospital.

Whitwell Gas, by the Staveley Gas Company; Barlborough Parish Council; Derbyshire County Council; Bolsover Gas Company.

HOUSE OF COMMONS.

The following Bills were read the second time and committed:—

Gas Provisional Order (No. 1) Bill; Ashington Urban District Council; Barnsley Corporation; Bedwas and Machen Urban District Council; Ossett Corporation; Preston Corporation; St. Anne's-on-the-Sea Improvement; Tees Valley Water; Wadhurst and District Gas; Walsall Corporation.

The following Bills have been read the second time and referred to the Examiners:—

Alliance and Dublin Gas Company Electric Supply; Deal and Walmer Gas and Electricity; Hayward's Heath Gas; Isle of Thanet Gas; Kidsgrove Gas; Leyland Gas and Electricity; Riddings District Gas; Southend Gas.

Notices were given for the rejection of the following Bills:—

Brentford Gas, City of London (Various Powers), London County Council (General Powers), Lurgan Gas and Electricity, Market Rasen Water, Middlesbrough Corporation, Northwich Urban District Council, St. Anne's-on-the-Sea Improvement, South Suburban Gas, Weston-super-Mare Urban District Council.

Glasgow Corporation Order.

A copy was presented of the report by the Chairman of Committees of the House of Lords and the Chairman of Ways and Means in the House of Commons, which states they are of opinion that "the provisions of the Glasgow Corporation (Water, Tramways, &c.) Order are of such a character and magnitude, and raise such questions of policy and principles, that they ought to be dealt with by Private Bill and not by Provisional Order."

LEGAL INTELLIGENCE.

AN AGREEMENT FOR THE SALE OF A CONCESSION.

In the Chancery Division of the High Court of Justice, last Friday, Mr. Justice SARGANT delivered judgment in the action of the *Hong Kong and China Gas Company v. Glen*. The Company claimed to have declared invalid and void certain clauses in an agreement dated July 14, 1862. An outline of the facts of the case was given last week [p. 446.]

His LORDSHIP, in the course of a long judgment, said the terms of the agreement were clear and unambiguous. He had come to the conclusion that the agreement was good in so far as it created an obligation on the Company to issue to Mr. Glen's representatives one-fifth of the capital as increased from time to time, but that it was bad in so far as it released the allottees from liability to pay the nominal amount in cash for such share capital so issued to them. As both parties had partially succeeded, there would be no order in the matter of costs.

POOR RATE APPEAL BY THE COLNE VALLEY WATER COMPANY.

The appeal of the Colne Valley Water Company against a recent assessment of £90 rateable value upon their mains laid in Northolt Parish came on for hearing at the Middlesex Quarter Sessions on the 31st ult.

Mr. ERNEST PAGE, K.C., and Mr. OLIVER HODGE were retained for the Company (instructed by Messrs. Crook, Milnes, and Jones); and Mr. COTES PREEDY appeared for the respondents (instructed by Mr. Charles Woodbridge).

Mr. HODGE stated that the Court would be relieved of the necessity of trying the case; the respondents having the day before approached the appellants' solicitor, with a view to settlement—ultimately agreeing to restore the old rateable value of £35, and pay the appellants' costs as taxed. He had, therefore, simply to ask the Court to allow the appeal, and make an order on the terms settled. This being assented to, the Court did accordingly.

The experts advising the Company—instructed by their General Manager, Mr. C. Purves Sinclair—were Messrs. C. F. Jones and Son, supported by Mr. H. H. Fuller and Messrs. John Taylor and Sons; while Messrs. E. H. Collins and Co. were for the respondents.

The rateable value sought to be imposed upon the Company was a sum equal to 65 per cent. of the gross receipts in the parish, and in respect to directly productive mains only. It has been calculated that if this percentage was applied to the entire undertaking of the Company (directly and indirectly productive parts) the hypothetical tenant would have to pay as rent, rates, and tenants' working expenses about £78,358, out of total receipts of £54,714—thus obtaining no remuneration for himself as his share, but incurring an annual loss of £23,644.

MISCELLANEOUS NEWS.

LIVERPOOL UNITED GAS COMPANY.

The Half-Yearly Meeting of the Company was held last Tuesday at the Offices in Duke Street—Mr. H. WADE DEACON, the Chairman, presiding.

The CHAIRMAN, in moving the payment of the usual dividends of 5 per cent. on the "A" stock and 3½ per cent. on the "B" stock for the half year to Dec. 31, said the operations of the six months had been very satisfactory, in spite of the extremely mild weather that had prevailed; and the sales of gas had largely increased. This was very gratifying, when they saw that in some parts of the country there had been no increased sales, and a diminution in many cases. The fact that their sales had increased by something over 4 per cent. was a testimony to the exertions of their officials in securing a wider use of gas. A cold day or two immediately sent up the demand; and if they had had a cold winter it would have taken them all their time to supply the requirements of the community. They had suffered, like other companies, because of the increased price they had to pay for coal and oil; but the outlook was now more hopeful that they would be able in the immediate future to buy coal at a less price. The proprietors would have noticed in the newspapers a very striking thing, if it was true—viz., that the London Gas Companies had bought a million tons of coal from Germany, instead of from Durham, as usual, and bought it at a very much lower price. The figures given were 13s. 6d. per ton, as against 16s. He did not suppose they would get German coal into Liverpool; but the mere fact that it was being introduced into London would probably make the coal market easier, and the Liverpool Company would most likely benefit from this.

The resolution was unanimously passed.

THE COMPANY'S BILL APPROVED.

Thereafter a Special Meeting was held to consider the Bill which the Company are promoting in Parliament.

The CHAIRMAN, in moving that the Directors be authorized to proceed with the measure, explained its main features, and why it was being promoted. As to the proposed adoption of a calorific standard instead of an illuminating one, he said that, with the exception of a very small proportion of consumers who still used flat-flame burners, the illuminating power was destroyed by the mixture of air with the gas burnt. The value of the gas, therefore, depended on the heat units; and the object was to supply as many units of heat as possible for each penny charged. The effect of the standard of gas adopted in Liverpool at present was to make the cost of production unnecessarily high. A calorific standard had been already granted by Parliament to several gas companies; and about a score of Bills seeking such powers were being promoted this year. Perhaps Parliament would take occasion to fix a standard for all companies. With regard to the sulphur question, this was considered by a Committee of the Board of Trade appointed in 1903; and they unanimously recommended that the tests should be abolished. The difference between the amount of sulphur in the gas generally supplied throughout the country and that supplied in Liverpool (where the test remained) was small; but the cost of getting rid of the sulphur was considerable. In the opinion of the Directors, the small difference was not worth to the consumers the cost involved.

There was a short discussion; and the motion approving of the Bill was then carried unanimously.

NEWCASTLE-ON-TYNE AND GATESHEAD GAS COMPANY.

The Annual Meeting of this Company was held last Tuesday—Sir W. H. STEPHENSON presiding—when the report was presented, containing particulars as to the working results for 1913, as summarized in the "JOURNAL" for the 10th inst., p. 379.

The CHAIRMAN, moving the adoption of the accounts, pointed out that coal (including oil and sundries) cost £196,966, or an increase of £26,765. This was accounted for: Firstly, by the contracts for coal entered into for the requirements of the twelve months from July 1 being at prices considerably higher than those for the previous twelve months (the price of oil, too, continued to be high). Secondly, by the increased requirements due to increased demand for gas. Other manufacturing costs were £76,133, or a decrease of £7827; repairs and maintenance of works were £6381 less; and carbonizing wages, £3223 less. All these items had been favourably affected by the installation of vertical retorts at Elswick. Distribution charges were £63,182, or an increase of £13,138. Management had cost £23,500—an increase of £3293, due to exceptional expenditure over the fitting up of the new show-room in Northumberland Street, to the National Gas Exhibition in London, and to a reorganization of the rental department, which would result in savings in consequence of the introduction of labour-saving appliances. Dealing with revenue, gas yielded £297,149, or an increase of £15,797; the quantity sold being 3,290,613,000 cubic feet, compared with the previous year, or an increase of 183,468,000 cubic feet. The sales in 1912 exceeded all previous records; and those of 1913 beat the record by 183½ million cubic feet, or 5·9 per cent. The principal causes contributing to the increased sales were: Increased number of consumers, increased use of gas appliances by consumers generally, full employment in the industrial works of the district, and freedom from serious labour troubles. The number of consumers and appliances out upon hire at Dec. 31 were: Consumers, 120,463, increase 2538; cooking stoves, 71,688, increase 2492; grilling stoves, 9282, increase 490; gas-fires, 9322, increase 3028. These did not, of course, take into account a very large number of gas stoves and fires owned by consumers, and also an increasing number of other appliances, such as water-heaters, irons for the laundry, boilers for supplementing the general water supply of the dwelling house, industrial apparatus, and many others. The number of consumers in 1903 was 63,328; now it was 120,463. Therefore they had nearly doubled the number of their patrons in ten years, and in the same period had increased the number of consumers per mile of main by 35 per cent. High-pressure gas was now being used to a large extent for industrial purposes; and this had the distinct advantage of increasing the day load of the Company's supply. The markets for residuals, while not as good as in the previous years, had been fairly satisfactory. The prices of coal and oil now showed signs of moderating before their next contracts had to be arranged. The first instalment of vertical retorts at the Elswick station had been in complete and continuous operation since March last. The nominal gas-making capacity of the section was 2½ million cubic feet per day; and the results of working had materially exceeded the estimated amount of savings—the cost of carbonizing per 1000 cubic feet of gas made being considerably less than at Redheugh, where they were already low for horizontal retorts. A further saving had been effected from the increased yield of residuals which was obtained from the vertical-retort system. The satisfactory results derived from the first installation influenced the Directors in deciding to erect the second and concluding installation of verticals at Elswick; and they had placed a further contract with the firm who supplied the first section. The capacity of the new section would be 3 million cubic feet per day; and one half would be ready for use in the autumn of the present year, and the remainder next year. The work of laying an independent system of steel mains for the conveyance of gas at a high pressure had proceeded as quickly as circumstances would admit during last year. The latter supply had been greatly appreciated by both classes of consumers and by the public generally, in consequence of the brilliant and perfectly white light it had introduced into the streets and buildings. Being such excellent lighting, it might be thought to be expensive; but the reverse was the case. Referring to the proposed issue of new ordinary stock, the Chairman explained that while the creation of this increased capital would involve the payment of an increased amount of dividend, it would only to a small extent affect the net revenue account, because the stock would largely take the place of existing loans which had been held during the long period of depression in the stock market. There were some 600 applications, or about three times more than they had ever had before.

The motion was agreed to; and, subsequently, at an extraordinary meeting of proprietors, a resolution was carried that the capital of the Company be increased by the creation of £200,000 of new ordinary stock to rank *pari passu* in all respects with the ordinary stock of the Company; and that such new stock be issued at such times as the Directors of the Company think fit.

WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held last Tuesday, at the Westminster Palace Hotel, Victoria Street, S.W.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

THE CAUSES OF DIMINISHED PROFITS.

The CHAIRMAN, in moving that the report and accounts be adopted, remarked that, while the full statutory dividends were recommended, it was his duty to tell the proprietors that this was in excess of the balance of profit. This being so, the proprietors might ask why the Directors announced at the end of the report that they had decided to reduce the price of gas in the Wimbledon limits by 1d. per 1000 cubic feet, and in the Epsom limits by 1½d. The answer was for two reasons: In the first place, the profit was not expected to be so low in the coming half year, because in the past half year they were waiting for a ship to be delivered, which was delayed through strikes and other things, and so was delivered in October instead of in May. The want of this ship caused them to pay the excessive freights which ruled during most of the half year; and as the steamers were not fit to go up to their derrick at Wandsworth, the coal had to be discharged twice over—first into barges and then into the works—instead of only once, as now. Then they had to pay for lightering and barging as well as the extra freights. In these ways, their Engineer and himself considered that they lost nearly as much money by these excessive freights and expensive methods as accounted for the difference in the profit. He might tell the proprietors that they attached great importance to the ships discharging the coal at Wandsworth, because, by reason of their having a derrick in the river there for unloading ships of 1500 tons, which came straight from the colliery at Newcastle, they had established a position which gave them an absolute predominance in economy in the supply of gas coal to all their part of Surrey. "Surrey" was a word with to them a large meaning; for hitherto they had only been dealing with Wandsworth and Putney. But, as a matter of fact, it was not possible to get coals into their part of Surrey for gas-making purposes at any rate so cheaply as by the Company's system of carrying the coal right away from Newcastle and unloading it at the wharf at Wandsworth. Another reason which caused them to make the reduction in price arose out of the fact that the increase in the sale of gas in the half year averaged 8·05 per cent. The Directors believed that this 8·05 per cent. was largely obtained owing to the considerable reduction made at the beginning of the year in the Wimbledon and Epsom areas, when they carried out the proviso contained in their Act of Parliament by reducing the price of gas 3d. in Wimbledon, and 4½d. in Epsom, although the coal market was advancing and going against the Company. This bold policy—they claimed it to be bold, and to have some merit - resulted in their increase being the largest obtained by any suburban company. The largest increase of a suburban company other than their own was a little over 4½ per cent. In part of London proper, there was a

decrease, and in part a small increase. In the progressive district of the South Metropolitan Company (which all gas men acknowledged was a right well-managed Company), the increase was only 1½ per cent. The policy of making reductions paid; and in this instance they found that the larger part of the 8·05 per cent. came out of the Wimbledon area. This proved that a reduction in price did conduce to an extra demand.

BOARD RE-ELECTIONS.

Part of the business of the meeting would be the re-election of a large number of the Directors. By reason of the form in which their Act of Parliament was drawn, the Directors of the Amalgamated Companies who would have retired from office on this occasion had the Companies remained independent, had still to go out of action that day. Afterwards one-third of the Directors would go out of office every year as was the usual practice. Next year there would be only one Director retiring from office according to the Act; but they must get into stride, and so next year they would have him at any rate volunteering for his post, and coming up again for re-election on that day.

THE CAPITAL EXPENDITURE.

Turning to the accounts, the capital expenditure had only been enlarged by £42,800, although the business had increased by 8 per cent. This addition was only 5¼ per cent.; and he thought the proprietors would realize that, if a company increased their business at a more rapid rate than the capital was increased, they were doing very well. But the figures here were even better than this, because, of the £42,800, no less than £12,500 arose out of the purchase of things which were not commonly gas companies' property. Included in the sum was part of the cost of the steamer for bringing coal from Newcastle, and of some large barges, which helped them to remove coal between the steamer and the retort-houses and stores. If, therefore, this sum were excluded, the addition to the capital was only 3¾ per cent., although the business had increased by 8 per cent. He hoped that, under the stimulus of the small reduction the Directors had now made, the increase would again reach 8 per cent.; and, as a matter of fact, during the past fortnight, the increase was 15 per cent. In connection with the reduction, the proprietors would notice the odd figure of 1½d. in the Epsom district. The wise people who interfered with their Bill insisted that a reduction should be made in Epsom in a certain proportion—that was to say, for every 1d. reduction of price in the Wimbledon district, there should be a reduction of 1½d. in Epsom. Perhaps this was right. It was not a bad proportion; but it was extremely inconvenient to the accountant, because it occasionally resulted in an odd halfpenny. It would be worth something to get rid of the odd halfpennies; but the Directors would try to avoid them turning up. The capital now worked out to the extremely small figure of 7s. 2⅜d. per 1000 cubic feet. The proprietors would see the Directors were husbanding their resources when he told them that this was the lowest capital in this part of England, and was practically the lowest about London, where the gas companies were naturally low in capital, because they were condensed in their populations, and in their areas in relation to population. The Directors were continuing to husband the resources of the Company; and he (the Chairman) would be disappointed, when next he met the proprietors, if he could not report a still lower average capital figure. This was important for the proprietors, because they obtained their dividends under the sliding-scale; and the maximum dividends were paid by a charge on the gas much smaller than the average among companies. The average was nearly 9d. per 1000 cubic feet; but, in the case of this Company, it was between 5d. and 6d.

INCREASED COAL COST AND THE SET-OFFS.

Looking to the revenue account, the effect of the advance of the price of coal was that it had raised the expenditure on coal from £74,000 to £91,000 in the half year. Against this they had got an increase in the revenue—not of 8 per cent., because that would have given them about £9600 on the £120,000. The larger part of the £9600 was given away in a reduction in price; and this left them with a net addition to income of £3750. This did not go very far to pay the £17,200 extra for coals. However, rents on meters and fittings had increased by £2421. This was a rather wonderful figure, because it meant that an enormous number of stoves for heating purposes had been going out during the half year. This was a mark in the history of gas companies of the wretched coal strike of two years ago, when the average householder discovered that while he could not get coal at all, or what he did get he had to pay dearly for, the gas companies kept up the supply of fuel at the ordinary rate. Therefore, the householder had since come to the gas companies for his stoves, and was now using gas to an extent that he (the Chairman) had never anticipated, and had never realized before—so much so that, when the temperature out-of-doors fluctuated, the sale of gas also fluctuated in a manner that was perfectly surprising. The colder the weather, the larger the outsend of gas. It was the experience of any Metropolitan gas company—and their own Company was now largely a Metropolitan one—that 1° depression in temperature meant 1 per cent. more output of gas, and this was after allowing for a normal increase of about 6 or 7 per cent. This they also found was the experience in their own Company. It was not altogether the best sort of growth for a gas company, because it came in the winter, and was not there in the summer. What they wanted were manufacturers who burnt gas for industrial purposes, and householders who did their cooking by gas, on midsummer days, when the warmth of domestic fires was not required. The residual products were better by £3080. This meant that a larger quantity of residuals had been made by reason of the 8 per cent. development in the business, but that the residuals had sold at lower prices. The figures added together still gave them a deficiency of £5656, which was practically the amount by which they were short of their dividend. But in the coal expenditure of £91,300, there was, as he had explained, an excessive and abnormal charge, owing to their having to hire ships instead of using their own, which they had partly paid for, but which was not delivered owing to the strikes. The charge for wages was moderate. The upkeep was very good indeed. It amounted to 4d. per 1000 cubic feet. The items for repairs in the outdoor department were likewise very good. They amounted to a figure of something more than 5d. per 1000 cubic feet. Profit-sharing was down for a sum of £2500, which did not amount to a large charge per 1000 cubic feet, and was money well spent in the contentment and cordial relationships it produced. This brought him to the profit, which was about 1d. per 1000 cubic feet short of the amount required for the dividend, which 1d. the Directors not only hoped and expected, but knew practically would be wiped out by the economy that the new ship would yield. It was very gratifying to know that they could carry coal by ship of as large a burden as 1500 tons right up to the part of the River Thames where their works were situated. Ships of such burden as this could not go much further, because the bed of the river shallowed above Wandsworth so rapidly that it was not possible; and those among them who had had to carry coal up side-creeks (such, for instance, as were found on the River Lea) knew that below 1200 or 1300 tons there was not the full economy that they might have expected.

CONSUMERS AND CONNECTIONS.

The number of consumers was now 68,210, of whom 29,972 were resident in Wandsworth, and burned 621 million cubic feet of gas; 34,304 were resident in the Wimbledon district, and burned 500 million cubic feet; and the small number of 3934 were resident in the Epsom area, and burned 67 million cubic feet. These figures meant that 52 per cent. of their income was derived from Wandsworth, 41 per cent. from Wimbledon, and slightly over 6 per cent. from Epsom. The increase in the consumers was upwards of 1243 in the half year. The stoves let out on hire had increased by the enormous number of 2561. He said it was "enormous," because it was a staggering thing week after week to find something like 150 to 200 of them going out in such a comparatively limited area of London as the Company supplied.

BAD TIMES, AND ISSUE OF CAPITAL.

During the half year, the Directors had had to raise more capital. It was an extremely bad time to do this. All gilt-edged securities had depreciated very sadly; and the Board knew, before they went on to the market, that the time was bad. Mr. Richards, their able auctioneer, told them they had better not sell so much. But what were they to do. If the proprietors looked at the balance-sheet, they would see the Company had now a bankers' loan of £90,000; and but for the sale of stock, it would have been £150,000. He (the Chairman) thought it would look very discreditable to face the proprietors with such a bank loan. But as the bankers were taking good care to have 5 per cent. on the loan, it was nearly as much as the dividend came to. Therefore the additional stock that had been issued did not mean that they had any extra burden upon the revenue of the year. But it was an unfortunate period to face the market with a sale of stock. The Directors did it in order to "dress their shop windows," as bankers would say, and to make the balance-sheet look a little less needy than it would otherwise have done.

CAPITAL EXPENDITURE AND WORKING ECONOMIES.

The proprietors might ask what the £40,000 of stock sold in the previous half year had been spent upon. The Directors expended a very large sum of money the previous half year, and in the past half year £8800, upon the arterial mains with which to couple-up the districts. A sum of £14,820 was expended in getting further retort power to meet the extra 8 per cent. in business, and to have a margin in hand. Then £6565 was spent upon meters and stoves, which showed what a large business the Company were doing in them. The money spent completed and modernized the plant; and they had a considerable amount of surplus plant. But part of the surplus was not necessarily of the most modern type, and it was not called into use last winter. Before it would be brought into use, it would be made up-to-date, and put into perfect condition. One of the elements to which the Directors looked forward as justifying a reduction in the price of gas was that, whereas when the Company were in Parliament, the Directors thought, and everybody thought, that the Mitcham works would probably be so far away from the coal supply from the Thames as not to have much value, and probably would have to be reduced in their scale of operations, they had been able, by an economical arrangement, to avoid this. Mitcham had turned out to be such a good distributing centre for coke (which was one of the problems that was causing a great deal of anxiety among the Metropolitan gas companies at the present time); and people wanted gas at Mitcham. Therefore, if they could sell gas and coke at Mitcham, and could get the coal there without spending much money, it was obviously the reasonable and the right thing to do. For this reason the Mitcham works would not be dismantled, as was feared when a petition was presented to the House of Lords, asking that the Company should be compelled to keep the works in operation whether or not they paid; but, as things had turned out, the works would not only be continued, but would even be extended. A gratifying feature on the petition to the House of Lords was that Lord Donoughmore considered it was such an immoral suggestion on the part of the local authorities that the Company should be compelled to operate works though unprofitable, that he struck a clause out of the Bill that was to act compulsorily on the Company for a period. All honour to his Lordship, because he saw the injustice of it. But the necessity did not arise for doing away with the Mitcham works. They had there a modern works, which reflected the greatest credit on the Engineer of the old Mitcham Company (Mr. B. R. Green); and they would be maintained. Nowadays the processes of gas-works were so cleanly and sweet that there could be no objection to them; and there was not a grain of anything that a gas company produced that was not valuable. So that, even among the lavender fields of Mitcham, a gas-works could remain without doing harm.

GAS-WORKS AS FUEL CENTRES.

He had mentioned Mitcham as being a good distributing centre for coke. He would like the proprietors to consider, as citizens of Great Britain, the enormous advantage it was to each community to have resident in their midst a stock of fuel. Gas, of course, was a very good fuel; and coke was one of the best fuels in the world. At the time when the ill-judged and brutal strike of coal porters took place, and an attempt was made to stop the supplies of coal to the hospitals and workhouses of London, the Company's works were invaded by poor women and children who wanted to take away little bags of coke, which they were allowed to do. The Company kept one of their works open all one Sunday at the time; and some 28 tons of coke were taken away in

small quantities to brighten the hearths of poor people who were denied, by people of their own rank of society, the opportunity of getting coal. He (the Chairman) did not know whether the Government and the rulers of the country quite appreciated the advantage that a gas company gave in this respect. A year ago he told the proprietors that a gas company could put coal to much more economical use than any other industry in the world; and this was another illustration of it. Tar was wanted for making dustless roads, coke for poor people in inclement weather, and the community at large required gas for all sorts of purposes. Coal mine owners who thought they could put up coke ovens at the pit head, and by recovery processes obtain tar and ammonia, with the highest economy, made a mistake, because gas-works could do with the coal what the coalowners could not do with it, seeing that the gas-works could dispose of the gas.

CO-PARTNERSHIP AND WAGES.

He would like to say that the relations of the Board with the staff and the employees generally were excellent. Outside, and quite independent, of their co-partnership scheme, they prided themselves on paying the best rates of wages current among working men. Two years ago, when the Board realized that the price of provisions had gone up, they voluntarily, and without a hint from any one of the men, increased their wages by 8 per cent. On Jan. 1 this year, they also diminished their labour by four or five hours per week; and this without solicitation or representation in any shape or form. The Company were fortunately indulged with a good business, which they were developing on business lines and profitably. Therefore they were able to do these things. He did not say that all employers could do the same; the Directors only rejoiced in the fact that they could do so. Inasmuch as settling up matters in connection with the amalgamation, the issue of stock, getting out the accounts, and other things, a great deal of work was thrown on the Secretary last year, and inasmuch as the laying of mains (with an impetuous Chairman behind him) bore rather onerously upon the Engineer, the Directors had made a bonus acknowledgment to both their chief officers, which Mr. Braine and Mr. Carr considered generous.

THE NEW ORDER.

One other point he would like to make before closing his address was that it had become more and more manifest to the Directors that nowadays the consumers must receive more attention, assistance, and guidance than they had been in the habit of getting in the past. Until the slot-meter burners came along, gas companies never went inside the houses of the consumers, under an exaggerated fear of the responsibility that might arise. The consequence was that consumers had to go to the ironmongers, who put in the cheapest (and nastiest) fittings they could possibly find, at contract prices. Then, after a few months, the gas company were bored to death by complaints arising out of the ironmongers' improper operations. The day of this was over. The gas companies faced the risk of putting fittings into the poor man's house. They then went to the rich man; and found he was going to the electric light in despair, owing to the crude and imperfect burners which had been left him by the ironmonger. Now the Company were in possession of letters from some of the chief householders in the Wimbledon Park area, where the aristocracy of the district resided, thanking them for the improvements effected by the Company's men. One lady wrote to the effect that she had no idea she could get such a good light from gas, or she would not have had electric light put into her house. Despite the great army of employees they had now out-of-doors, the Company would have to get more men to give that attention, instruction, help, and guidance to the consumers which they needed to make the gas serve its best uses, and the convenience and comfort of the consumers.

The DEPUTY-CHAIRMAN (Mr. R. Garraway Rice) seconded the motion.

COAL PRICES AND COAL FROM GERMANY.

Mr. A. S. GURNEY asked whether the price of coal was going up or down.

ANOTHER PROPRIETOR inquired whether the Wimbledon shareholders would receive an extra dividend of 7½d. next August and an extra 1s. 3d. next January, in consequence of the reduction in price.

Alderman PORTER was pleased to hear that the Directors were increasing the number of the outdoor staff, as there had been complaints from people in Wimbledon of not receiving proper attention.

Dr. BARKWELL remarked that when the Directors were issuing stock to the proprietors by tender, they put the minimum price at 112; and then afterwards they went to Mr. Richards, and offered to take any price they could get. Had the Directors put the minimum price lower in the first instance, he was sure there would have been a larger response from the proprietors; and he did not think it was good business to subsequently let the public buy at a lower price by auction than the proprietors could do by tender. He also inquired whether the Directors had bought any coal from Germany. He knew a few Germans pretty intimately; and he understood that some German societies contributed to societies in this country to help to keep up strikes. This was done in order that they might acquire additional trade that ought to come to this country.

The CHAIRMAN said that he had just come away from a Board meeting where they had purchased a considerable quantity of coal at a reduction of 1s. 9d. per ton, or 14 per cent. less than a year ago. Their own Company would have their contracts out in a few weeks; and he would be bitterly disappointed if they did not get a reduction of something like 2s. 6d. per ton. As to the increase in the dividend, it would not happen next June, as they must first have a complete half-year's reduction. The reduction in the price would mean £4830, while the previous reductions represented something like £10,000 a year to the districts of Wimbledon and Epsom. As to the complaints that had been received, the congestion would be relieved by the additional men they were going to employ. As to the issue of stock, no one regretted more than he did the result of the tendering. The policy of the old Wandsworth Board had always been to issue stock by auction in the open market; and he (the Chairman) was a strong believer in this mode of issuing it. But the practice of the Mitcham Company had been to issue by tender; and they had found the practice answered. It was a mistake to suppose that the first issue of notifications of a sale by tender was only to the proprietors. By law, they were compelled to offer new stock, whether by auction or tender, to all the world. The issuing by tender was an experiment which he regretted directly the tenders came in; two or three unfortunate tenderers offered a most extravagant premium for the stock, to be sure to get some. The reserve price that was fixed when the stock was offered by auction was only arranged after he had had much argument with Mr. Richards, who said, under the conditions of the money and stock markets, he could not make the reserve higher. His own predilection was for the open market; and, while he was on the Board, he hoped future issues would be in this way. As to the German coal, he saw in the papers a report that one London Company had bought a million tons of it. He did not believe it. If a company had bought any, probably one-tenth or one-hundredth of the amount would more likely be true. He was a Director of an important European Company who bought coal in all directions; and the coal they got from the Continent was not, for gas-making purposes, nearly so good as that obtained from England. However, they were blessed with free trade; and if the Directors could get for the Company's purposes cheaper coal in Germany, they would go there for it.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the following rates per annum: On the Wandsworth "A" stock £8 7s. 6d., "B" stock £6 17s. 6d., and "C" stock £5 17s. 3d., on the Wimbledon stock £6 2s. 6d., on the Epsom stock £6 12s. 6d., and on the new ordinary stock £5 17s. 3d.

On the motion of the DEPUTY-CHAIRMAN, seconded by Mr. WALTER HUNTER, the Directors retiring by rotation (Messrs. H. E. Jones, W. G. Langlands, G. F. Page, H. S. Freeman, and R. M. Chart) were re-elected.

Moved by Mr. J. C. PORTER, and seconded by Mr. W. RICHARDS, Mr. E. L. Burton was re-appointed as an Auditor.

On the motion of Mr. LAURIE ANDREWS, seconded by Mr. SAMSON, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN responded on behalf of himself and his colleagues, and then moved a vote of thanks to Mr. Carr, Mr. Braine, and the staffs at each of the stations, as well as to the workmen. They had, he said, excellent staffs and excellent men—men who worked conscientiously and honestly.

Mr. BURTON seconded the motion, which was heartily agreed to.

Mr. BRAINE and Mr. CARR acknowledged the vote on behalf of themselves, their staffs, and the men—both testifying to the excellent way in which all had helped them during the extraordinary work succeeding the amalgamation.

CROYDON GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday, at the Offices, Katharine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice calling the meeting; and the Directors' report and the accounts [see *ante*, p. 454] were taken as read.

SIR CORBET WOODALL'S ABSENCE.

The CHAIRMAN, in moving the adoption of the report and accounts, said he wished in the first place to say that Sir Corbet Woodall, who was taking a much-needed and well-earned holiday in the South of France, had asked him to express his regret that this fact prevented him from being present that day. He (the Chairman) was sure the proprietors would all join in the hope that his stay there would prove beneficial to his health, and that he would return to them quickly.

THE ACCOUNTS.

Before referring to the working of last half year, he would like to remind the proprietors that it was nine half years since the profits earned had been insufficient to pay the dividends, and during this period the carry-forward had been steadily built-up from £5589 to £25,728, which was considerably more than a half-year's dividend. Although the accounts now submitted did not show the excess of profits earned over the amount required for dividend which had characterized those of several years past, they might, nevertheless, if viewed in the light of the exceptional conditions that had prevailed, be regarded as extremely satisfactory. The accounts compared very favourably with those of most of the London and Suburban companies, which had, in common with themselves, suffered severely from the coincidence of very high prices for coal and oil with a very bad market for coke.

COAL, OIL, AND RESIDUALS VALUES—GERMAN COAL.

As the proprietors doubtless knew, coal contracts were usually made in the early summer for the twelve months—from July of one year to June of the next; and when last year the Directors were negotiating for the purchase of this year's requirements, not only were the ideas of sellers very inflated, but they were for the time being (partly through the after-results of the coal strike, and partly through brisk trade generally, and the consequent heavy demand for coal at home and abroad) able to practically dictate their own terms. For the coming contract season, he was glad to say signs were not wanting that negotiations would be conducted on a less unequal basis; but for the half year to June, they would still suffer from dear coal. No doubt many of the proprietors had seen that some of the Metropolitan companies had purchased large quantities of German coal; and he had no doubt the coal owners would take this into consideration. In their own case, they did not intend to make their contracts just yet; and the Directors hoped that, by the time they were making inquiries for prices, there would be a considerable reduction on last year. Oil had also been very high in price; while the chief residual—coke—had realized very poor prices. The effect of these three combined causes had naturally affected the profits very materially—in fact, had coal, oil, and coke been at the values of a year ago, other things being the same, the profits would have been greater than they were by more than £12,000.

Viewed in this light, the small deficit on dividend—£390—sank into relative insignificance.

THE COKE POSITION.

It was interesting to note that in the half year to December, 1908, to which he had alluded, the Directors had (as now) to face a combination of high prices for coal and low prices for coke. The unsatisfactory state of the coke market merited more than a passing notice. It had been due mainly to three causes. The rapidly growing output of gas throughout the country had naturally resulted in a corresponding increase in the output of gas coke; and this increase had been intensified by the reduced use made by many gas undertakings of their carburetted water-gas plant in consequence of the high price of oil. The unseasonably mild weather of the late autumn and early winter had delayed the customary winter demand for coke; and the use of coke for cement-making had shown a decline. The cement trade absorbed very large quantities of the coke made in and near London; and any diminution in the requirements of the trade naturally resulted in the necessity for finding fresh outlets for a large quantity. Storing coke was a wasteful and costly process, and the extent to which it could be stored was rigidly limited by physical considerations; while, as coke was a bye-product of gas manufacture, adjustments between supply and demand must always be in the direction of modifying the latter. Hence a temporary over-production tended to produce a rapid and very serious fall in prices. It was to be feared that, owing to altered methods of manufacture of cement, the demand for coke for this purpose would be a lessening one, unless coke were to be sold at prices much below what had been customary. An urgent need therefore existed for increasing in other directions the demand for coke. Naturally, the first direction to which one looked was the local home market—that was, among their own consumers. He was glad to say that steps had for some months been actively taken in London, and more lately (through the efforts of the British Commercial Gas Association) throughout the country, to make more widely known the good qualities of coke as a domestic and industrial fuel. For these purposes, it had much in its favour. It was smokeless; it was far cheaper than coal; and a much larger proportion of its latent energy could be converted into useful heat—in fact, it was stated on good authority that 44 per cent. of the heat in coke could be used, as against 19 per cent. of that in coal. As the amount of heat latent in a ton of Croydon coke differed little, if at all, from that in a ton of medium-class household coal, it could readily be seen how economical a fuel was coke. These facts were being brought before the public by central advertising, supplemented in their own case by an active campaign in the district; and, he was glad to say, with good results. Last month they delivered to consumers nearly 1000 tons of coke—about half as much again as in January of last year. They had also acquired a motor lorry, which enabled deliveries to be effected quickly in the outlying districts. The low price of coke at present was a powerful factor in getting its use adopted by householders; and if they succeeded, as he thought they would do, in considerably increasing its local use, the temporary loss of revenue might be not without compensation in the future.

GROWTH OF THE BUSINESS—NEW HOLDER AND OTHER PLANT.

The business generally continued to grow in a very satisfactory way. Despite the mildness of the weather, the sales of gas showed an increase of 3·42 per cent. To put it in more concrete form, the sales for 1913 exceeded those of 1912 by 62 million cubic feet—in itself a not inconsiderable output. During the half year, 1073 consumers had been added to their books; and the number of stoves in use had grown by 2966. If they went back for a comparison to a year ago, the increase became, for consumers 2124, and for stoves on hire 4399. Still more striking, especially as regards stoves, became the figures if they went back five years. Since 1908 the consumers had increased in numbers from 33,643 to 43,510, or by 9867, and the stoves on hire from 21,516 to 38,258, or by 16,742, while the sales of gas had increased by 325 million cubic feet—a quantity much larger than the total output of many gas-works. Such rapid and steady growth as this naturally involved rearrangement of the plant for manufacture and storage. The latter was with them the most urgent problem of the moment; and as they would see from the report, they had decided upon the erection of a new holder with a capacity of 6½ million cubic feet. The last holder they erected was a 3 million cubic feet one; and they thought then that this would meet requirements for a longer period than it had done. The close relationship (in inverse ratio) of output to temperature tended at times to tax the Works Manager's resources very severely. A few degrees drop in temperature in the winter might easily send up the daily demand by over a million cubic feet; while a continued spell of cold weather, bringing into action the thousands of gas-fires in the district, meant severe pressure sustained day after day. On Christmas Eve, the Company sent out 7¼ million cubic feet; and during the first five weeks of the year the sales of gas had exceeded those of the corresponding five weeks last year by 13 per cent. In addition to commencing upon the new holder, they had nearly completed the reconstruction on modern lines of some condensing and washing plant in the older part of the works. The original plant was erected in 1866. The cost was largely borne by the renewals fund; and they would gain considerably, both in efficiency and economy, through being able to treat all the gas made in plant of a modern type. The erection of the new holder would entail a considerable outlay, and necessitate the issue of fresh capital. The proprietors would have received with the report and accounts forms of tender for "D" stock, and 5 per cent. debenture stock. The former was not unlikely to be considerably over-applied for; and those who were unsuccessful in obtaining it would be able to tender for the latter. For some years past, the relationship of capital expended to gas sold, and the cost of the capital employed, had been reduced in a very satisfactory way—the former in three years by 1s. 4d., and the latter by 1d. per 1000 cubic feet. For a short time, this reduction would be checked; but he hoped and believed it would soon be resumed at its wonted rate.

EXTENSION OF OFFICES, SHOW-ROOMS, ETC.

In August last, he expressed the hope that the extensions of the offices would be completed in time for the meeting being held on this occasion in the new Lecture Hall. The work had taken rather longer than was anticipated. But it was now nearing completion; and they would shortly be occupying the new premises, where he hoped to have the pleasure of meeting the proprietors in the summer. He felt sure the proprietors would agree that the co-operation of the Company with the Corporation of Croydon in the widening of the street had resulted in a great improvement in their part of the town. The new show-room and district office at Norbury was making progress. When completed, they would have facilities for making a good show of gas appliances in this rapidly growing part of the district, with ample room for fitters' workshops and district stores, while the consumers would have the convenience of paying accounts and giving orders without the need for coming into the centre of the town. They had also, while using the corner for their show-room, retained a frontage to London Road, which would, as the district developed for shopping, have considerable value.

THE NATIONAL GAS EXHIBITION.

In the accounts generally, other than the items to which he had already referred, there was not much which called for remark. The expenditure under the head of "General charges, advertising, &c.," showed an increase; but this was wholly accounted for by the increased amounts spent in advertising—very necessary nowadays—and by the Company's share of the cost of the very successful gas exhibition held at Shepherd's Bush in October. It might interest the proprietors to know that certainly over 5000 residents of the district visited the exhibition. The excellent display made of the services that could be rendered would, he did not doubt, help the sales department for some time to come.

The DEPUTY-CHAIRMAN (Mr. Thomas Rigby) in seconding the motion, congratulated the Chairman upon his interesting speech, and said he had every confidence in the future of the Company.

Mr. C. WEBB (Messrs. Helps and Son) asked whether the Board had considered the desirability of having an official quotation of the various stocks. He also suggested that a reprint of the proceedings should be sent to the proprietors. Many of the other companies in which he was interested sent to the proprietors a report reprinted from the "JOURNAL OF GAS LIGHTING."

The CHAIRMAN pointed out that the Company now had more than 2000 shareholders; and one difficulty of sending out a report as suggested was that they could not forward it with the dividend warrants, which were despatched the day following the meeting.

The motion was unanimously carried.

Mr. WILLIAM CASH, F.C.A., moved the declaration of dividends, less income-tax, at the following rates per annum: On the "A" stock, 15 per cent.; on the "B" and "C" stocks, 12 per cent.; on the "D" stock, 5 per cent.; on the "E" stock 10 per cent. He remarked that, although the Company had not entirely earned the dividend it was proposed to distribute, it was only a small sum that they were taking from the carry-forward. They were, in fact, only taking from it the sum of £390; and, under the circumstances of the half year, this was insignificant. With the greatest confidence, he moved the resolution.

Mr. PERCY H. HALL, J.P., seconded the motion, which was unanimously adopted.

The CHAIRMAN proposed that Mr. Rigby be re-elected a Director. He remarked that their Deputy-Chairman's work in itself showed up better than any words of his (the Chairman's) could make it do. A more conscientious and hard-working Director never sat on a Board; and his business knowledge had been of great value to the Company.

Mr. SAMUEL SPENCER seconded the motion; and he also spoke of the Deputy-Chairman's diligence in his duties.

The proposition was heartily carried.

The DEPUTY-CHAIRMAN having thanked the proprietors for their confidence in him,

Mr. CASH proposed the re-election of Sir Corbet Woodall. He remarked that they were all sorry Sir Corbet could not be there that day; but the Chairman had explained the reason of his absence. No words of his (Mr. Cash's) were necessary to recommend Sir Corbet to the proprietors. His name and work were so well known to them all; for he stood absolutely at the head of his profession. Any company was extremely fortunate in being able to claim a share of his experience and advice; and this experience and advice were always at the disposal of the Croydon Company. In the construction of works and in many other ways they had had the advantage of his assistance.

Mr. HALL seconded the motion, which was cordially agreed to.

Mr. WILLIAM EDGAR moved the re-election of Mr. James C. Benwell as Auditor of the Company. He observed that Mr. Benwell had a vast experience of gas accounts, and of the accounts of this Company in particular.

Mr. BERNEY seconded the motion, and it was heartily agreed to.

Mr. BENWELL, in his acknowledgment, said he should like to pay a tribute to Mr. Topley and his staff for the complete manner in which the books and accounts of the Company were kept.

Moved by Mr. SAMSON, and seconded by Mr. MAITLAND, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN acknowledged the vote on behalf of his colleagues and himself. He then moved a vote of thanks to the officers, staff, and workmen for their efficient services. He had nothing but good to say of their Engineer (Mr. Caddick), their Secretary (Mr. Topley), their Distribution Engineer and Sales Manager (Mr. Sandeman) the Assistant-Accountant (Mr. Haines), and the Assistant-Secretary(Mr. Anderson). They had all served the Company in the best possible way. As to the workmen, they were working under congenial conditions, and were happy and contented; and the Company obtained from them good and efficient service. The Directors had done their best to secure their good-feeling; and there were not wanting signs that it was appreciated. He was sure they had as good a staff as any gas company in the kingdom.

Mr. W. J. RUSSELL observed that, not as a Director but as a retired member of the staff, he should like to second the motion, and to endorse their Chairman's words. No one knew better than himself the satisfactory way in which the duties of the staff and men were performed.

The motion was cordially passed.

Mr. A. CADDICK (Engineer and Works Manager) said it was a great

pleasure to him to respond on behalf of the employees at Waddon. He could not speak too highly of the services rendered during the half year by all in his immediate department. They were working under ideal conditions; and so long as the present relations and zeal continued, the prosperity of the Company was assured. The proprietors had heard from the Chairman that the cold weather recently experienced had taxed very much the manufacturing department—more especially in regard to storage; and he should like to place on record his appreciation of the loyal services during that period which relieved very much the responsibility that rested on his shoulders.

Mr. TOPLEY also responded for his staff and himself. In doing so, he expressed his appreciation of the kind expressions of Mr. Benwell as to the way the accounts and books were brought before him; and in saying this he desired to record his personal indebtedness to his staff for the way in which they had carried out their duties.

Mr. SANDEMAN, replying for his staff and men and himself, observed that the distribution department had had a strenuous time; but both the staff and men had done their work in a satisfactory manner. The Chairman had referred to the large increase in the output of stoves; but he should not like the proprietors to go away with the idea that they were taking the line of least resistance, and were devoting their energies to this work to the detriment of the lighting section, in which competition was very keen. But the great improvements that had been made in gas-burners and lighting fixtures generally enabled them to put up a good fight in this direction, and they were holding their own very well.

The CHAIRMAN remarked that the Directors had signed a contract with the Croydon Corporation. The Company proposed to put improved burners into the street-lamps; and the Corporation had agreed to a contract for a considerable period. The Company wanted the Corporation to be satisfied that they could give them as good a light as, or a better light than, they could obtain from electricity.

BOURNEMOUTH GAS AND WATER COMPANY.

Enlarged Undertaking—New Capital and New Works.

The Ordinary General Meeting of the Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the half year with which he had to deal had not been a kind one to gas companies. The increased prices of coal and oil, the decreased prices of residuals, and the marvellous mildness of the whole of the season had brought an undue strain upon gas companies generally. Some of the strongest and best had felt the effect of it, and many of them, as no doubt the proprietors were aware, had had to draw upon their reserves, in order to pay their dividends. It was, therefore, with the greatest possible pride and pleasure that, in presenting the accounts and in moving the adoption of the report, he had to point out that the accounts showed that, during the half year, the Company had earned their full statutory dividends, and that the report suggested what no doubt was a proper following—that they should be paid. To meet the increased demands made by the enlargement of their works, and the taking over of two new undertakings that were coming into the fold, the Directors had to raise additional capital; and it was because they had done this that, in his opening remarks, he made a special point of the strength of the Company. The Board had had to issue the debenture stock to which the proprietors gave their consent at the last meeting; and they had to do this at perhaps one of the worst times in the state of the market that they had known for many years. Therefore he thought he might say that they had, under the circumstances, been extremely fortunate to get out the debenture stock at about 95. At the same time, he might congratulate the proprietors who had obtained and held this debenture stock at so comparatively cheap a price. But, like Oliver Twist, the Directors asked for more; and that day they were going to request the proprietors to authorize them to issue 2000 preference shares, in order to spend the money which was absolutely necessary not only for the development of their present business, but for acquiring the other business which the new Act had given them authority to do. These shares would be sold in a few days; and he could commend them very strongly to the proprietors. The Directors had already had several offers to buy them. He could only say that nobody better than the existing proprietors could know the strength and position of the Company; and, knowing how well the Directors had used the money entrusted to them in the past, the Board felt they might apply to them with confidence when they saw a chance of profitably spending money in the future. The new Act became law within literally a few minutes after the last half-yearly meeting; and the Company were acquiring both the Wimborne Water Company and the Christchurch Gas Company as fast as the necessary legal proceedings would permit them. They anticipated a considerable strengthening of the Company by the taking over of the two undertakings. As to the past half year, it was described by their Engineer and General Manager (Mr. Harold W. Woodall) as having been one which was "marked by great activity;" but it rather dealt with work commenced than with work completed. Some of the money which had been handed over to the Board had been spent at Poole, in large new carbonizing and purifying plant; and this was nearly completed. What was very satisfactory was that the early and most difficult steps connected with the construction of the tank for the new gasholder had now been passed. They had got through the worst of the difficulties and troubles; and the Directors hoped that everything would now go right in the future. At Wimborne they had been sinking a new shaft to the well, so as to enable them to drive more collecting adits in the chalk as they were required. The yield of water there was very satisfactory and hopeful; and they looked to having an increased supply of the excellent Wimborne water to send into Bournemouth. At Longham they had maintained the plant in the highest possible efficiency. The engines had been overhauled, and the connections had been rearranged, so that each engine could work independently of the other. Speaking generally of the whole of the half-year's working, the results had been most satisfactory. There had been improvement all round; and though they had had a largely increased output of gas, they could congratulate themselves that this had been accomplished by the use of 1000 tons less coal. Although not entirely, to a very large extent this saving was due to the increased make of gas per ton, for which they could heartily thank their General Manager. As a rule, he (the Chairman) did not take up much time in speaking of the future. But, incidentally, he might say that the Directors thought the coal difficulty had reached bottom; and they were looking forward to some ease in this respect. At the same time, he should like to warn the proprietors that the evil of these things lived after them, like other matters. The present half year would have to bear the full burden of the increased prices of coal; and it would also have to bear the reduced price of water, public lighting, and meter-rents, which the Directors had arranged for in the provisions of the new Act. At the same time, he thought they could look forward to the present half year and the future with confidence. They had had, as a nice helpful contrast to the mild weather of last year, a pleasant cold snap in January, which had done gas companies a great deal of good, and of which they had had the full advantage. Of course, the new plant they were putting into their works would give them increased and greater economies which would help them in the future. The first paragraph in the King's Speech was usually one expressing congratulation that the country had been on friendly relations with the different Powers, and with everybody around. In regard to the Company's little commercial kingdom, he (the Chairman) could wind up his speech with a similar report and congratulation. The Company were singularly fortunate in being on friendly terms with everybody with whom they had to work. It had always been a tradition of the Company that they should be so. They had cultivated it; and he was glad to say they had received full benefit from it. In passing a Bill through Parliament, they had to deal with many local authorities; but, in their case, they had had no difficulty whatever. The Company did not get all they wanted, nor did the local authorities. Their relationships, however, were such that they were able to settle, in a friendly way, any differences that existed. These relationships they would continue to cultivate to the utmost extent. At the present time the Company were on the most friendly terms with all the authorities. He could extend these remarks to their staff and workmen. In respect of their co-partnership scheme and dealings generally with those who worked for them, they were most happy, and long might this continue. In the co-partnership scheme they seemed to have solved one of the most difficult problems of modern times; and he hoped it would continue to spread its good influences. He should like to pay his respects from the highest to the lowest in the service of the Company for their ability, loyalty, and enthusiasm.

Mr. CHARLES L. MORGAN seconded the motion, which was unanimously carried.

The CHAIRMAN moved the declaration of the dividends at the following rates per annum, less income-tax: 6 per cent. on the preference shares; 7 per cent. on the "B" ordinary shares (including dividend on the 1000 shares issued in June last, calculated from the due dates of payment); and 16 per cent. on the original shares. These, he remarked, were all the full statutory dividends.

Mr. WILLIAM CASH, in seconding, said he should like to say that he was performing this duty, which, like a great many others, had hitherto been undertaken by Sir Corbet Woodall. He wished to say, on his behalf, how much he regretted that he was unable to be present at the meeting. The proprietors knew, as well as the Directors, what an advantage it was to the Company to have the assistance of Sir Corbet on the Board. That he happened to be out of England was the cause of his absence from the meeting. He had also to express the same regret that their colleague, Mr. R. Hesketh Jones, could not be present. He had been a regular attendant at their meetings until quite recently; but his health did not permit his attendance that day. With regard to the dividends, these had been fully earned. The Chairman had drawn attention to the fact that they were spending a large sum on capital, that they had still further expenditure to make, and that, under the provisions of their Act, they had certain concessions to meet in the current half year, in the shape of reductions to consumers. But the Directors were looking forward with confidence to the future. He might remind the proprietors that, though they were carrying forward a sum equivalent to that which was brought into the half year, this was after providing for the sum of £3500 written-off for works displaced while building the new works—in other words, so far as they were replacements, the capital account would not be debited with the works. A sum of £1000 had also been paid as compensation with respect to certain land recently acquired. This was a sum which would not be continued; but there was still a comparatively small amount of it to be written-off. It seemed proper, in a sense, that the proprietors should be declaring the full statutory dividend in what was the jubilee year of the Company.

The motion was unanimously adopted.

Proposed by Mr. MORGAN, and seconded by Mr. CASH, the Chairman (who was one of the retiring Directors) was re-elected.

The CHAIRMAN, in the course of his acknowledgment, said that it was about 27 years since he took a position on the Board. He proceeded to propose the re-election of Mr. Cash, whose services, he said, were highly valued by his colleagues.

Mr. J. C. BENWELL seconded the motion, which was heartily agreed to.

On the proposition of Mr. R. H. GLEN, seconded by Mr. BENWELL, Mr. F. G. Barrett was reappointed an Auditor of the Company.

Extraordinary Meeting.

An Extraordinary Meeting was then held to consider a resolution to authorize the Directors to raise additional capital, by the creation and issue of 2000 preference shares of £10 each, limited to a dividend of 6 per cent. per annum.

The CHAIRMAN moved a resolution accordingly. He remarked that

he had already explained the purpose for which they required the money. They had two undertakings to take over; and they had to increase and strengthen their plant everywhere. They were doing this, he hoped, wisely and well. Under these circumstances, the Directors would have no difficulty whatever in issuing it at a remunerative price to the Company.

Mr. CASH seconded the motion; and it was at once carried.

Moved by Mr. A. WOODS, and seconded by Mr. BARRETT, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN responded on behalf of his colleagues and himself. He also moved a vote of thanks to the General Manager, the Secretary, their staffs, and the employees generally. The Company were, he said, singularly fortunate in their staff, and one and all, aided by the workmen, did their utmost to bring about splendid results.

Mr. H. R. GLEN seconded the motion.

Acknowledgments on behalf of those concerned concluded the proceedings.

DERBY GAS COMPANY.

Presiding at the recent meeting of the Derby Gas Company, the Chairman (Colonel George Gascoyne, J.P.) said the Board congratulated the proprietors on having had a very successful and prosperous year. The Company was in an eminently strong and satisfactory position, notwithstanding a variety of difficulties which had had the effect of reducing the amount of the balance carried over from the revenue account. There had been a large increase in the output of gas. Coal had cost £12,429 more in the past twelve months than in the preceding year. The price of gas was reduced 2d. per 1000 cubic feet, as from Jan. 1, 1913; and this policy had resulted in a constantly increasing demand for gas for domestic and manufacturing purposes. As a matter of fact, this increase amounted to nearly 44 million cubic feet; but owing to the concession in price, about £2000 less had been received for it. However, after payment of the full dividend, there was a substantial balance to carry over to the next account. The undertaking was in a thoroughly strong position; and there was every reason to believe it would continue to flourish for many years to come.

In answer to a question, the Engineer (Mr. J. Ferguson Bell) stated that the amount of gas made per ton of coal carbonized during 1913 was 11,217 cubic feet, and the quantity of sulphate of ammonia made was 1207 tons 17 cwt.—working out at the rate of 26·88 lbs. per ton carbonized, which was the highest yield for the coal used.

The report having been adopted, it was agreed that the standard dividend on the consolidated stock be paid, at the rate of 5 per cent. per annum for the six months to Dec. 31, with an additional 1 per cent. for the whole year—6 per cent. per annum, less income-tax.

GAS AND WATER COMPANIES REPORTS AND ACCOUNTS.

SOME OF THE CHIEF ITEMS OF NOTE.

Ascot Gas and Electricity Company.—The shareholders of this Company meet to-day (Tuesday), when the Directors will report a profit on last year's working, on the gas account of £5320, and £1592 on the electricity account. After providing for every charge against the year's working, interest on the debentures and loans, an interim dividend for the first half of the year, and setting aside £300 for reserve for depreciation of plant, there remains a balance of £3720, out of which a dividend of 6 per cent. will be recommended, leaving a balance of £1046 to be carried forward.

Barnstaple Gas Company.—It was stated at the meeting of the Barnstaple Gas Company that the revenue for the past year had been £11,205, against £10,873 in the previous year. The production of gas was 49,850,000 cubic feet, of which 45,928,700 feet was sold—an increase of over 2,000,000 cubic feet on the year. The extension of the main to Instow had brought in a fair number of consumers.

Brighton and Hove Gas Company.—This Company's half-yearly meeting was held last Friday, when it was reported that, compared with the half year ended Dec. 31, 1912, the sale of gas was slightly less in the past six months—the result of the abnormally mild weather during the closing months of the year. The revenue from residual products was, however, £4291 more. The profits for the half year amounted to £28,762, to which was added £42,724 brought forward—giving a total of £71,485. After charging income-tax and interest on the debenture stock, and appropriating £1800 to the capital redemption fund, a sum of £66,361 was available for dividends, which were recommended, at the statutory rates of 6 per cent. on the "B" preference consolidated stock, 4 per cent. on the "C" preference consolidated stock, 11 per cent. on the "original" ordinary consolidated stock, and 8 per cent. on the "A" ordinary consolidated stock. This would require an appropriation of £23,305, and leave £43,056 to be carried forward.

Newcastle and Gateshead Water Company.—The 69th annual meeting of this Company is being held to-day (Tuesday), when the Directors will report gross receipts last year of £213,632; while the expenditure on working charges (including management and maintenance) was £52,394. There was a balance brought into the year's accounts of £4361; so there will be £165,569 to allocate. The interest on the preference stock for the year absorbed £55,243; and the interim dividend on the ordinary stocks for the first six months, £29,622. The final dividends recommended will need £39,143 for their payment; and so there will be a balance forward of £5647. During last year, the Company laid new pipes—from 2 to 24 inches in diameter—to the extent of nearly 10½ miles.

North Middlesex Gas Company.—In comparison with the corresponding period of the preceding year, the sale of gas, June to December, 1913, showed an increase of 16,012,200 cubic feet, or 12 per cent.; and the revenue from residual products an increase of £806. The net profits for the half year (after charging interest, income-tax, &c.) amount to £4946, which, with £4284 brought from the previous half year, makes the disposable balance £9231. The Directors recommend dividends of 5 per cent. on the preference capital, 11 per cent. on the original ordinary capital, and £7 14s. per cent. on the additional ordinary capital. After payment of these dividends and carrying £474 to the reserve fund, there will be a balance of £4585 to be taken into the current half-year's accounts.

Northwich Gas Company.—The Directors have declared a dividend of 9 per cent.; being a reduction of 1 per cent. The report states that the year's profit is £3135. The gas receipts show an increase; but the revenue has fallen through increased charges and a decline in residuals. After paying the dividends, £135 is carried forward. The revenue for the year was £13,362, of which £12,292 was from gas.

Tynemouth Gas Company.—On the 5th prox., the shareholders of this Company meet to pass the accounts for last year. They show that the revenue for the year was £89,302; and the expenditure, £79,276—leaving a balance of £10,026 as profit. The manufacture of gas during the year showed an increase of 25,602,000 cubic feet, equal to 4·76 per cent. The revenue from gas was £61,648, against £56,633 in the previous year; and from residuals, £27,607, against £27,171. The report continues: "The price of gas has remained at the low figure of 2s. per 1000 cubic feet, less discounts of 5 to 20 per cent., since Jan. 1, 1906. Owing to the continued high price of coals, the recent increases in wages, and the price of other materials, it has been necessary to draw upon the balance carried forward during the past two years, in order to make up the dividends and interest on capital. The Directors have therefore decided to increase the price of gas by 2d. per 1000 cubic feet as from the next reading of the meters, over the whole of the Company's area of supply." The number of ordinary and automatic prepayment meters in use at Dec. 31 last was 22,131, being an increase of 705 in the year. The Engineer of the Company, Mr. W. Hardie, reports that all the works and plant are efficient and have been maintained in good order.

Wakefield Gaslight Company.—The 133rd annual meeting of this Company was held on the 16th inst. Alderman G. A. Moorhouse, J.P., who presided (in the absence through illness of the Chairman of the Company, Dr. W. A. Statter, J.P.), in moving the adoption of the report and balance-sheet, said there had been a satisfactory year's trading, with sufficient profit to pay the usual dividends and increase the amount carried forward by a small sum, in spite of the high price of coals, &c., and notwithstanding reductions in the price of gas during the year amounting in the aggregate to 2d. per 1000 cubic feet. By a "singular coincidence," they had carbonized exactly the same amount of coals as in the previous year—viz., 27,602 tons—while they had made 12,647,000 cubic feet more gas, or 4·03 per cent. The make of gas per ton of coal carbonized, 11,827 cubic feet, was the highest in the history of the Company, as was the make of gas during the year—viz., 326,465,000 cubic feet. In the hope that the cost of coals would be reduced this year, the Directors had decided to reduce the price of gas by another 1d. per 1000 cubic feet, as from March. In their report the Board, reporting the death of one of their number, mentioned that they had appointed the Engineer and Manager (Mr. H. Townsend, M.Inst.C.E.) to fill the vacancy.

The Kingstown Lighting Schemes.

As a result of the promotion of the Alliance and Dublin Gas Company's Electric Supply Bill and the Dublin and South District Electric Supply Bill, the Kingstown Urban Council, on the 16th inst., by ten votes to five, authorized an application to the Board of Trade for a renewal of the Kingstown Electric Lighting Provisional Order of 1896, which was revoked in 1904; or, in the alternative, for an Order under the Electric Lighting Acts to enable the Council to supply electricity for public and private purposes within the district. Mr. W. A. Evans had contended that the motion was out of order, on the ground that there was in existence an order of the Council approving of the Dublin and Southern District Company's Bill; but the Chairman (Mr. J. J. Kennedy) ruled that the motion was in order. It was further agreed to appoint a Committee to consult on the Bills now before Parliament; and to act as might be deemed advisable. Mr. H. J. Marks said if this meant that they should have power to acquire the Dublin and Southern Bill, he was firmly opposed to it, and so were the ratepayers. Mr. Evans said the only legitimate course was to take up the Dublin and Southern Bill, and have the scheme established in an agreement to purchase under arbitration in eight or ten years. If they tried to have that Bill "sold," the Gas Company would say that the Southern Company were only acting as a "stalking-horse" for the Council. The Chairman said the Council would not act justly if they did not remember that they encouraged the Southern Company to spend money out of capital on the understanding that the Council would support the Bill. Mr. M. F. O'Brien mentioned that a rumour that the Southern Bill had already been "sold" to the Gas Company had been officially denied, but only, he added, "in a non-committal manner." Mr. R. MacGovern, Secretary to the Southern Company, has since written to the Press that, not only has the Company's Bill "not been 'sold' to the Gas Company, but the question of 'selling' it has never even been thought of." At another meeting of the Kingstown Council on the 19th inst., it was agreed to oppose the Dublin Southern District Company's Bill in Parliament; a resolution of approval passed in January being rescinded. The Chairman said the rescinding of the previous resolution would not seriously affect the Bill.

The Tottenham District Light, Heat, and Power Company will be issuing next month, by tender, £55,000 of their "B" consolidated stock at the minimum price of £115. As pointed out by the Directors, the price of gas in the district being now 2s. per 1000 cubic feet, a maximum dividend of 6 per cent. may be paid.

CONSOLIDATED GAS COMPANY OF NEW YORK.

Annual Report.

The following is the report of the New York Consolidated Gas Company for the year ended Dec. 31, which was submitted at the meeting on the 26th ult. In point of detail, it presents a striking contrast to the meagre reports presented by the Directors of many English gas companies. As a frontispiece, a view is given of the Company's new building, an account of the structural features of which appeared in the last number of the "JOURNAL."

The report is preceded by the following condensed statement of the Company's assets and liabilities on Dec. 31.

Assets.

Fixed assets, including land, plant, and equipment	$54,112,534
Bonds and stocks of, and advances to, affiliated Companies, and other investments	101,105,396
Bonds and mortgages	200,000
Cash	5,802,190
Accounts receivable	3,000,199
Material and supplies	968,568
Total	$165,188,887

Liabilities.

Capital stock	$99,816,500
Debentures and notes	18,738,025
Accounts payable and accrued charges	6,838,384
Stock and bond premiums	13,951,397
Renewal and reserve fund	10,813,041
Profit and loss	15,031,540
Total	$165,188,887

The figures thus far available respecting the Company's operations for the calendar year 1913 indicate that the earnings of the Company from its gas business during the year (after deducting the reserve for renewals and contingencies) amounted to $1,501,100. For the purpose of determining the earnings applicable (in accordance with the decision of the United States Supreme Court) to the value of the tangible and intangible property ($79,560,331) employed in the Company's gas business, there should be added the surplus earnings of the Astoria Light, Heat, and Power Company ($403,518), and the interest received on the investments in the stock and obligations of the Company (exclusive of interest received from the Astoria Company on its capital expenditures during construction, this being hereinafter included in the item of dividends and interest received), $696,860; making the total earnings from the Company's gas business for the past year $2,601,478. This amount is equivalent to 3·27 per cent. on the above stated value of the tangible and intangible property, employed in the manufacture and distribution of all gas sold by the Company.

Dividends were paid during the year on the capital stock aggregating 6 per cent., and amounting to $5,988,990. The dividends and interest, received on stocks and bonds owned and advances made to affiliated Gas and Electric Companies operating in the boroughs of Manhattan, Queens, and the Bronx, and the County of Westchester (excluding interest on the investment in the Astoria Light, Heat, and Power Company as above), amounted to $5,522,326. The interest paid during the year on funded and other debt amounted to $887,855. The surplus (including that of the Astoria Company) over dividends paid, carried to the profit and loss account for the year 1913, amounted to $1,246,959.

On June 25 last, $15,000,000 of the Company's eight months 6 per cent. collateral trust notes were sold; and on the 10th of August, $5,000,000 of the Company's twelve months 6 per cent. collateral trust notes, which matured on that date, were paid off.

Permission having been granted by the Public Service Commission of the First District to the Company to purchase the preferred and common stock of the New York and Queens Electric Light and Power Company and the stock of the New York and Queens Gas Company, there were acquired during the year 7662 shares of the preferred and 9659 shares of the common stock of the New York and Queens Electric Light and Power Company out of 12,500 shares of preferred and 12,500 shares of common stock outstanding; and there were also acquired 6000 shares of the stock of the New York and Queens Gas Company—being the entire issue thereof.

The headings in the new tunnel between Astoria and the Bronx were joined on July 17, 1913.* There were at that time only 474 feet of bench to be excavated; and on the 5th of October, only 114 feet. On the latter date a faulty seam in the rock was suddenly encountered, through which the water poured into the tunnel in such volume that it was impossible to check it. The tunnel south of the Bronx bulkhead was completely flooded, and the water rose in the Astoria shaft to the river level. As a precautionary measure, an additional safety bulkhead was at once constructed in the Bronx end, and the one already in position was strengthened, in case the latter should give way under the hydrostatic pressure from the river. When this work was completed, drilling was again commenced from the Bronx end. Grout was forced into the crevice, and the inflow of water from the river was thus partially checked. Additional pumps were then installed, to replace those submerged in the bottom of the Astoria shaft, and all the water was pumped out by the 1st of December. A second bulkhead was immediately built about 60 feet south of the Astoria bulkhead at the end of the bench, as an additional precaution. The whole situation is now under control. Drilling and grouting are proceeding from the Astoria end; and present indications are favourable for soon beginning the excavation of the remaining portion of the bench.

At the new water-gas plant at Astoria, which was completed and put in operation in May, 1912, a marked improvement was made during the latter half of the past year in the quantity of gas manufactured by each machine. The total production at Astoria amounted to 10,372,054,000 cubic feet, of which 51·32 per cent. was coal gas and 46 68 per cent. water gas. The coke market, which is generally unstable in this locality, has been held fairly steady as to price by our using in the water-gas generators the surplus production.

Besides coke, our principal residual products are coal tar, ammoniacal liquor, water-gas tar, ammonium sulphate, and cyanogen press cake. Though the new tariff has made substantial reductions in the duty on some of these products, there has thus far been no material change in their market price.

By reason of the shortage in the supply of petroleum products, referred to in our last annual report, the increase this year over last year in the price of gas oil, in so far as it affects the Consolidated Company, will amount to approximately 1·8 c. per gallon. In the case of the Companies manufacturing water gas exclusively, this increase will amount to nearly 9 c. per 1000 cubic feet of gas made. In the case of the Consolidated Company, as the large quantity of coal gas which it manufactures requires a smaller amount of gas oil for enrichment, it will amount to approximately 5·5 c. per 1000 cubic feet.

The condemnation proceedings instituted by the City of New York in 1901 to acquire, for water-front improvement, a portion of the Consolidated property between Sixteenth and Eighteenth Streets, Tenth Avenue, and North River, known as the "Eighteenth Street Station," were concluded, and the award of $3,456,433, including interest, was paid to the Company on Oct. 9, 1913.

In January, 1907, the City of New York under condemnation proceedings acquired for hospital purposes title to a portion of the Consolidated property between East Fifteenth and Sixteenth Streets on the East River, known as the "Fourteenth Street Station." The proceedings, for the purpose of determining the value of the property taken, are still pending.

On Aug. 1, 1913, the City of New York acquired title by condemnation proceedings to a portion of the property of the Company between West Forty-Fourth and West Forty-Sixth Streets on the North River, known as the "Forty-Fourth Street Station," for water-front improvement purposes. Gas making at this plant was discontinued on Aug. 22. All the apparatus located on this condemned portion of the property was sold at auction by the City, and is now being removed. It has also dredged-out the bulkhead and a large part of the upland. The value of the apparatus and buildings located on the portion of the property not taken by the City which has been rendered useless for manufacturing purposes, has been appraised by our experts, and a claim for consequential damages will be made in respect thereof.

THE COMPANY'S NEW BUILDING.

Last fall the Standard Gaslight Company's new ten-storey building, at the corner of One Hundred and Tenth Street and First Avenue, designed and constructed under the supervision of the Consolidated Company's Engineering Department, was completed. The repairing of the meters and stoves of the Consolidated and its constituent Companies, which was theretofore done by the former Company, will in future be made by the Standard Company in its new building, which has been equipped with the most modern and efficient apparatus required for making repairs. It is expected that this change will result in substantial economies in this item of operating cost.

The buildings located at Twenty-First Street and First Avenue, which were formerly occupied by the meter and stove repair shops, have been remodelled, and converted into a thoroughly up-to-date garage for the accommodation of the various gas and electric motor vehicles employed in the Consolidated Company's service, and also into shops for the necessary repairs and maintenance of this equipment. It is the intention to operate all motor vehicles belonging to the Company, excepting the emergency cars and five trucks at the One Hundred and Fifty-Ninth Street shop, directly from this garage, and in the adjoining shops to overhaul, repair, and paint all motor vehicles, horse-drawn vehicles, and tool carts, as well as overhaul and repair all harness and stable equipment. It is expected that this will greatly enhance the efficiency of this department, as well as reduce the cost of its operation.

In order, as stated in our last annual report, to provide additional accommodation for the several departments of the Consolidated Company, and also for all the Gas and Electric Companies in the borough of Manhattan, in which the Consolidated Company is interested, and maintain elsewhere only such local offices as are required for the transaction of business with the public, it was found necessary to remodel and extend the plans for a twelve-storey office building, to be located on the plot of land, 297 ft. 6 in. by 84 feet on the south-east corner of Irving Place and Fifteenth Street, the first section of which had been already erected, and to design the present eighteen-storey building, which covers the entire area.

In undertaking to raise the original twelve-storey building six additional storeys without departing from a homogeneous architectural design, the Engineering Department encountered an exceptional difficulty. To overcome this, large girders were placed in the roof structure of the new eighteen-storey building, 250 feet above the sidewalk; the girders spanning the width of the existing twelve-storey building, and supported entirely by the adjoining new steel structures on either side. Extending downwards from these girders are hangers, to which are attached the floor framing, down to and including the fourteenth floor; while above the girders, and resting upon them, are the roof and also the roof-house containing elevator machinery. The upward extensions of the front and rear walls are also suspended from the girders. Several of them weigh 40 tons each; and the task of erecting them was unusual in building construction, but was successfully carried out in less than two days without any mishap. Observations made since the suspended portion of the building has been completed indicate that the structure possesses all the rigidity and stability expected. It was observed during several days in December, when high winds prevailed, that there was throughout the entire structure a complete absence of the vibration so frequently experienced in buildings having a height relatively great as compared to the base.

The new building, including the original twelve-storey structure, is of the most modern fireproof type. It contains 381,100 square feet of floor space available for offices, excluding corridors and stair halls.

*An illustrated description of the tunnel will be found in the "JOURNAL" for the 5th of August last (p. 363).

All floors and partitions are of incombustible material; the interior trim, doors, and mouldings being of enamelled steel. Its construction was supervised by the Consolidated Company's Engineering Department. The architectural features were designed by the firm of H. J. Hardenbergh. The decorative night illumination of the exterior of the building is effective and artistic.

In the basement are boiler and machinery rooms and an industrial appliance display-room. All of them are finished with tile floors, and the walls are of a light shade of facing brick.

On the ground floor are commercial offices for the transaction of business with the public and show-rooms for the display of gas and electrical appliances. These are simply but appropriately decorated in Botticinna marble and Caen stone. The main entrance and elevator foyer are given a little more prominence by the use of Pavanazza marble and are slightly more elaborately decorated. The office floors are simple in design; particular attention having been paid to sanitation and the necessary facilities for the economical administration of the several departments. Directly over the original twelve-storey structure is the auditorium for lectures and meetings of the educational societies composed of the employees of the different Companies.

The space on the twelfth, sixteenth, seventeenth, and eighteenth floors, assigned for the immediate use of the Consolidated Company, is now occupied by its several departments. The fitting-up of the interior of the building is rapidly approaching completion; and it is anticipated that the space assigned to the affiliated Companies will be occupied by them about March 1, 1914. Space not required at present by the Consolidated or the other Companies will be rented.

The restaurant in the roof house is provided with gas and electric kitchens, in which the most modern apparatus has been installed. All the details have been carried out with a view to producing hygienic service; and they are of such a character generally that the equipment may be advantageously shown as a model for hotel and restaurant installations throughout the city.

The Educational Course.

The educational course, carried on by one of the prominent National Gas Associations, has been much amplified and its scope extended by inaugurating a new course of instruction in the utilization of gas and gas appliances. Heretofore this work has been designed principally for those engaged in the selling department. The present course aims to provide systematic instruction for persons interested in the installation and maintenance of gas appliances. The practicability of such a method of instruction is made more certain by supplementing the usual correspondence course by class meetings, in which the printed lessons are explained and discussed. As in the former courses, a large number of employees from the affiliated Companies have been enrolled, including 175 from the Consolidated Company. In each case the employing Company pays the cost of tuition. There is every indication that this will prove a valuable and profitable work, the benefit of which will be shared mutually by employer and employee. The value to the Company from the service standpoint, in rendering assistance of this kind in the general improvement and development of its employees, is apparent.

Steps are also being taken to give those employees who are engaged in the sale, installation, and maintenance of gas appliances a better idea of the work and purpose of the Department of Utilization than they have had, and particularly to provide accurate information and instruction in the proper installation and operation of appliances which have been, or may be in future, adopted as the result of this department's work.

Stated meetings of the Society of Gas Engineering of New York City, the membership of which is composed of the superintendents and heads of the different departments of the Consolidated and its affiliated Companies, were held throughout the year. The attendance was large, and much interest was shown by the members. At several of the meetings lectures were given by men of reputation in their several lines—commercial, mechanical and professional. When the subjects permitted, these lectures were illustrated by lantern slides. All were interesting as well as instructive.

A course in accounting, under the direction of a professor from the New York University, consisting of weekly lectures and the periodical examination of students, was carried on last winter, and was attended by a large number of employees. It was followed by a series of lectures designed to illustrate the application of sound accounting theories to the practical operations of the various departments of the gas and electric business.

Another course, designed to train the junior clerks employed in the allied industries in the fundamental principles of book-keeping, consisting of weekly lectures and periodical examinations conducted under similar auspices, has just been instituted, and will be continued during the remainder of the winter.

The school of instruction, wherein young men are given a thorough mechanical training—including the locking and unlocking of meters, indexing, installing burners, repairing leaks, taking measurements for and connecting meters and appliances of all kinds, and making minor repairs to appliances on the district—and are also instructed in the Company's rules and regulations, especially those relating to their deportment while performing their duties on consumers' premises, had an average attendance during the year of about fifty apprentices.

Miscellaneous Matters.

Other welfare work of the Company—embracing relief during illness, protection against loan sharks, and giving free legal aid and service annuities—has been continued, and is greatly appreciated by the employees.

The new gas appliance display rooms, where a complete line of domestic and hotel, and also of some industrial, appliances is exhibited, were opened to the public in May last. A model apartment, consisting of seven rooms, equipped with the most modern as well as the most artistic and appropriate heating, cooking, and illuminating devices, has attracted numerous visitors. Several of the prominent Women's Clubs have been entertained in the apartment, and given demonstrations in the proper use of gas for domestic and illuminating purposes.

In view of the urgent necessity for developing the utilization of gas for other than illuminating purposes, particular attention is being given to the display of appliances of all kinds in the branch offices, as well as in the display rooms rented for this purpose. During the year the Companies installed 85,313 gas appliances, including 2102 lineal feet of hotel gas-ranges.

The Consolidated and its affiliated Companies have out on rental 392,518 cooking appliances of various types. An effort to standardize them resulted during the year in the adoption of new models for the elevated oven type as well as the cooker type of gas-range, known as the "Peerless Cabinet" and the "Peerless Junior" ranges, designed by our Department of Utilization. The standardization of repair parts results in the simplification of the work of maintenance and repair, and greatly facilitates the repairing of these appliances on the consumers' premises. The ultimate elimination of the great quantity of complicated repair parts now necessarily carried in stock is another very desirable feature, and will result in substantial economy in the cost to the Company of maintaining its rental stoves.

The development of prismatic glassware for illuminated signs has made more practical the application of gas to this branch of exterior illumination; and this subject is being pursued experimentally with encouraging results by the Department of Utilization. A gas-illuminated sign of this character has been placed on the Company's branch office building at the corner of Third Avenue and One Hundredth and Fourteenth Street, and, while its performance has been satisfactory to date, there are possible improvements which it is believed will result in making the development of this class of business of greater practical commercial value.

In spite of the high degrees of excellence to which the modern incandescent gas-lamp has been brought, many of the old and comparatively inefficient types of open-flame burners remain in use. In the interest of good lighting service, and for the purpose of promoting the proper and economical use of gas for illumination, a systematic campaign has been instituted, which has for its object the substitution of modern efficient lighting equipment for the inferior types of burners. The results have been most encouraging, and clearly demonstrate the advisability of such promotive activity, both for the purpose of improving the lighting service rendered and of familiarizing the general public with the best forms of incandescent gas lighting.

While the incandescent gas-lamp consumes less gas than the average open-flame burner, it does not necessarily follow that any material reduction in output will result. An efficient, satisfactory light will be made greater use of than an unsatisfactory one. Every efficient incandescent gas-lamp installed is an advertisement for more and better lighting; and while the immediate result may be to reduce to some slight extent the quantity of gas consumed, the ultimate result will be to promote and increase the utilization of gas for illumination.

Electricity Supply.

Rotary converter capacity to the extent of 21,000 kilowatts and 3000 kilowatts of storage battery capacity were added in sub-stations; rotary converters of 6000 kilowatts capacity, the property of the Third Avenue Railroad Company, have been installed in sub-stations of the New York Edison Company and the United Electric Light and Power Company, and are being operated under the terms of the agreement with the Railroad Company referred to in our last report.

On the alternating current system, 12,000 kilowatts were added to the sub-station transformer capacity, and 48,000 kilowatts of step-up and step-down transformers were installed to connect the Waterside and Kingsbridge Stations with 16,000 volt interstation ties, to enable the plant of the Railroad Company to be shut-down at off-peak periods.

The construction of the new generating station of the United Electric Light and Power Company, located on the Harlem River, which was commenced in July, 1912, was at the close of the following year practically completed. There are at present installed and in operation three 15,000 kilowatt turbo-generators of the horizontal high-speed type. The building, switch structure, boilers, and a part of the miscellaneous equipment, including ash and coal handling machinery, make provision for five additional units; the station having been designed and constructed for an ultimate capacity of 120,000 kilowatts. A considerable part of the investment already made has, therefore, anticipated future requirements for 60-cycle alternating current.

The One Hundred and Eighty-Seventh Street sub-station of the United Company was brought to completion early in the past year, and put in operation; one section of Manhattan Island being controlled from this point. It is estimated that this sub-station will supply the needs of the Company in the upper north-westerly section of the city for approximately the next eleven years; additional transformers, regulators, and other apparatus being necessary from time to time. Some equipment of this character will be required this year. The assembly room provided by the Company on the top floor of this building, which is complete in every detail, has been freely used by the employees of the Company for meetings of the various departments.

The West One Hundred and Forty-Seventh Street fireproof seven-storey building, erected and occupied by the United Company during the year, has been fully equipped, and is now devoted to the miscellaneous requirements of the Company for this section of the city, such as garage facilities, store-room, meter-shop, laboratory, and general repair shops, and for the housing of the construction and other departmental forces.

As has been the custom in the past, the Electric Companies conducted an interesting general display during the annual Electrical Exhibition at the Grand Central Palace last October. By this method the many improvements during the year in electrical appliances are brought before their customers and the general public.

Some Statistics.

The municipal street lamps on the lines of the Consolidated Gas Company and its affiliated Gas and Electric Companies on Dec. 31 last consisted of 25,597 incandescent gas-lamps, 96 open-flame lamps, 12,428 electric arc lamps, and 21,559 electric incandescent lamps—a total of 59,680 street lamps. The total number of gas-meters in use at the end of 1913 was 904,303, and of electric meters 262,026.

The combined sales of gas of the various Companies during the year

were 29,262,457,670 cubic feet—an increase of 0·39 per cent. over the previous year. The sales of electric current during the year, excluding sales to the Third Avenue Railroad Company, amounted to 441,237,534 kilowatt-hours—an increase of 10·09 per cent.

The taxes charged against the earnings of the Consolidated Company and its affiliated Gas and Electric Companies during the year amounted to $3,965,082.

There was expended during the year, for additions to, and extensions of, the producing and distributing plants of the various Gas and Electric Companies, the sum of $12,839,532. At a cost of $4,535,745 for repairs and $2,516,442 for renewals, or a total cost of $7,052,187, all these properties have been maintained at the highest possible point of operating efficiency, thus ensuring the best results as to the quality of the gas and electric service, as well as economy in the cost of the production and distribution of gas and electricity.

LEIGHTON BUZZARD GAS-WORKS PURCHASE PROPOSAL.

Rejection of the Council's Bill.

The eleventh-hour decision of the Leighton Buzzard Urban District Council to promote a Bill to enable them to exercise the option to purchase the gas undertaking which was given them by the Leighton Buzzard Gas Act of 1891, has been useless. The determination was the result of a Bill which has been deposited in Parliament by the Gas Company; but the Council allowed much time to elapse before they determined to take action. Therefore their Bill was entered after the expiration of the statutory period, and permission had to be sought to allow it to proceed as a late Bill. It came before the Lord Chairman of the Standing Orders Committee in the House of Commons last Wednesday week, and was rejected on the ground that no urgency was disclosed. Thus it will have to stand over for twelve months.

Meanwhile, the Council will oppose the Gas Company's Bill, in the hope of securing a clause to the effect that the Act shall not come into operation in the event of the Council promoting their Bill in the next session. Mr. R. Richmond, the Chairman of the Gas Company, is also a member of the Council; and some of his fellow-councillors complain that he did not inform them on the earliest possible date of the intentions of the Company. However, the keen edge is doubtless taken off the disappointment of the Council at their rebuff by the announcement that the Public Lighting Committee "observe with pleasure that, as a result of recent developments, the price of gas has been reduced 2d. per 1000 cubic feet, thus saving about £400 to the gas consumers, and about £15 10s. per annum to the Council in respect of public lighting."

In the course of their official statement in regard to the matter, the Committee say:

Your Committee are advised that the recent statutory meeting of the Council will hold good in complying with the Borough Funds Acts next session, and that the steps taken by the Council, and the greater part of the expenses incurred up to the present time, are not wasted, but are merely in suspension until the Council are able to promote their Bill next session. Under the provisions of the Leighton Buzzard Gas Act, 1891, the Company cannot oppose the Council's Bill. Therefore, the costs of promoting the Bill will be reduced to a minimum.

The maximum dividends which the Company are authorized by Parliament to pay amount to £1893 per annum; and the price of the undertaking would be a certain number of years' purchase of this £1893. First-class gas stock can be purchased to pay 5¼ per cent., which is at the rate of 19 years' purchase. It is believed that the utmost the Company will receive at arbitration will not exceed 22 years' purchase. This being so, the purchase price would not exceed £1893, multiplied by 22 = £41,646. It is expected that the cost of the Council's Act and the arbitration will not exceed £2600 (which will be repaid out of loan); so that the total cost to the town of acquiring the undertaking will be about £45,000 at the outside. The Council anticipate that they can borrow the money at 3½ per cent. and repay same by way of annuity extending over a period of forty years. This would require a yearly sum of £2107 10s. (including instalments off loan and interest).

The profit of the gas undertaking for 1912 (including interest on investments) was £2039; and the Directors' and Auditor's fees £283, or a total profit of £2322. This would leave a balance of profit, after deducting the £2107 10s. for loan instalment and interest, of £214 10s. The profit of the gas undertaking for 1913, including interest on investments, was £2699 13s.; and the Directors' and Auditor's fees £232 11s., or a total profit of £2932. This would leave a balance of profit, after deducting the £2107 10s. for loan instalment and interest, of £824 10s. The Council are assured by their Gas Engineer (Mr. E. H. Stevenson) that much saving can be made in the items which the Company have placed under the heading of "repairs and maintenance," and that the management charges ought to be reduced; also that a further saving can be made by increasing the quantity of gas produced per ton of coal to the average quantity. These savings should amount to between £800 and £1000 per annum.

The report having been adopted, letters were read from Messrs. Baker and Sons (the Council's Parliamentary Agents) stating that under section 38 of the Gas-Works Clauses Act, 1847, every gas company must send a copy of their annual accounts to the Clerk of the Peace; and there was a penalty of £20 for each default. As the Company's accounts for the year 1912 only had been sent to the Clerk of the Peace for Bedfordshire, the Company had incurred penalties for twenty years amounting to £400. It was in the power of the Council to take proceedings for these penalties, or, in the alternative, they might ask Mr. Richmond to supply to the Council complete copies for all the years since 1891, on the understanding that no proceedings were taken. In a further letter, Messrs. Baker and Sons stated that there was the additional provision imposed by section 35 that a copy of the accounts was to be forwarded to the local authority of every district within the limits of supply. This did not appear to have been in any way complied with. By this section, a penalty was incurred by the Company of 40s. for each day during which such default continued. The penalty therefore in respect of the non-deposit of the accounts for the year 1891 would appear to amount to the modest sum of £8760, and a corresponding like amount for each of the succeeding years.

Mr. Chapman: The total penalties amount to £176,000.

STOCKPORT GAS WORKERS' THREATENINGS.

An Emergency Committee Meeting Summoned.

Some unrest prevails at Stockport among the gas-workers who are members of the Municipal Employees Association, in consequence of certain statements which have appeared alleging that the Corporation have not carried out their part of the agreement entered into at the conclusion of the strike last October.

The trouble at Stockport, it will doubtless be remembered, lasted for about three weeks, and cost the borough several thousands of pounds; the men eventually returning to work on terms which included the reinstatement of all gas workers without penalization or victimization (see "JOURNAL" for Oct. 21 last, p. 241). The men now complain that, while all the gas workers have been taken back, some have been penalized, "being put on inferior jobs;" while in the Cleansing Department it is alleged that a number of men have not even been taken back. There are also allegations of "tyranny" at the gas-works, and the men also say that nothing has been done to carry out the promised alterations in the working conditions.

The local branch of the Municipal Employees' Association has brought matters to a climax during the week-end by the publication of the following notice, which they state was arrived at by resolution at a recent meeting:

> The municipal workers of Stockport desire to inform the ratepayers that a good deal of tyranny is existing, making it impossible for comfort at work. . . . Nothing has been done since our strike in September last; and we cannot get the Emergency Committee to meet us. Will you ratepayers therefore insist upon the representatives of your respective wards meeting us at once; otherwise we shall not be responsible should another strike take place.

It is stated that some of the gas workers even went so far as to suggest an immediate strike, alleging that they had been asked to submit to rules that were impossible. An official of the Union also added that some of the men declared that they would rather come out again without any hopes of strike pay than "work under conditions that were akin to those that might prevail in a convict settlement." The Emergency Committee had not yet met them; and if they refused to carry out the terms of settlement agreed upon, a public meeting of ratepayers would be called, and it would be left to the meeting to decide whether there should be another strike.

REPLY OF THE CHAIRMAN OF THE GAS COMMITTEE.

Alderman Fernley, the Chairman of the Gas Committee, when he was shown the resolution referred to, remarked that it was rather curious that, although the Municipal Employees' Association had been repeatedly asked by letter by the Town Clerk (Mr. Robert Hyde), to submit specific cases of grievances, the only reply was a reference to certain cases in which they alleged that men had not been reinstated. So far as he (Alderman Fernley) knew, all the men who came out on strike had been reinstated, either in their own or some other department of the Corporation. It was rather singular that the men should again bring in the question of tyranny. The men had been repeatedly asked to sign the terms of settlement, but had not done so; and this was the reason why the Gas Committee had not appointed their expert to consider the question of alterations at the gas-works. The Corporation were doing what they could to honourably carry out the terms of settlement, but had received very little assistance from the men.

A meeting of the Emergency Committee—the Special Committee appointed by the Corporation to deal with matters arising out of the strike and in regard to the settlement—has been called for this week, in order to discuss the various matters raised by the men.

END OF THE BLACKBURN GAS STRIKE.

Men Accept Terms Offered Seven Weeks Ago.

Over seven weeks ago, the skilled workers employed by the Blackburn Corporation Gas Department came out on strike, on the "sympathetic" principle, apparently with the view of forcing the hand of the Committee into granting concessions to the unskilled workers who were engaged in other departments of the Corporation. The Corporation, however, firmly resisted the attempt to raise the wages beyond the standard rate of 6d. per hour; this being the amount paid by the private firms in the district. Mr. J. R. Clynes, M.P., the Lancashire District Secretary of the National Union of Gas Workers and General Labourers, contended, on behalf of the men, that it was unfair to compare corporation workers' pay with that of private firms; his argument being that corporation should be compared with corporation. Arising out of the dispute the Corporation appointed Mr. John Bond, the Gas Engineer to the Southport Corporation, to report upon the conditions of working at the Hollinwood Gas-Works as compared with the Addison Street Gas-Works at Blackburn. The result of the report was that early in January advances were offered to the machinemen, attendants, firemen, and pipemen; but they were not accepted. No advance was proposed for the labourers; so the skilled workers decided to give effect to the notices tendered a few weeks previously. The men had, prior to this, loyally observed a fortnight's truce; but no settlement was arrived at, and the strike commenced among the 450 skilled and unskilled workers on New Year's Eve. The demands of the employees in the Gas and Water Departments will be found in the "JOURNAL" for Nov. 25 last (p. 963).

It was apparent quite at the beginning of last week that an early

settlement of the dispute was at hand, for on Monday night Mr. J. R. Clynes, M.P., the men's leader, along with Mr. Fleming Eccles, the Organizing Secretary, Mr. Albert Lees, one of the Lancashire organizers, and Councillor E. Porter, the local Secretary of the Union, were closeted with the Strikers' Committee for some time, and they discussed at length the suggested terms of a settlement. Subsequently Mr. Clynes had a long conference with a representative of the Corporation (Alderman Crossley, an ex-Mayor), who, it was stated, had agreed to act as mediator. The "conversations" were adjourned until the following day, when it was decided to at once lay the settlement proposals before a mass meeting of the men. The gathering lasted several hours; and at the conclusion it was officially announced that the men had unanimously passed the following resolution: "That this meeting of Corporation workmen authorizes the officials of the Union to arrange for a resumption of work upon the terms put forward." Mr. Clynes added that no difficulty was anticipated in the matter of the reinstatement of the strikers. The men had received satisfactory assurances on this point, and no temporary men were to be retained if it meant keeping out of employment any of the regular Corporation employees.

Subsequently a document embodying the terms of settlement was formally signed at the Town Hall by the Mayor (Alderman Higginson, J.P.) on behalf of the Corporation, and by Mr. Clynes, on behalf of the men. Some of the principal clauses affecting the gas and water departments are:

The Corporation, while maintaining the principle of the standard rate, agree to the following terms—viz.: They will reorganize their gas-works and other departments, and the men shall place no difficulty in the way of such reorganization; the Corporation not to be bound in all cases to recognize and apply the principle of seniority in service.

The following alterations and rearrangements in regard to work and wages shall at once come into operation; and the rates shall be paid from the time of the resumption of work:

(*a*) *Gas Stokers.*—Oldham rate of pay coupled with a rearrangement of the work as nearly as possible to the Oldham conditions.

(*b*) *Gas Labourers.*—25s. per week of 49 hours to men so long as they are employed within the works.

(*c*) *Lamps.*—Reorganization.

(*d*) *Gas and Water.*—One shilling bonus to men whenever called out at night to emergency cases. [This also applies to the tramways, highways, and electricity departments.]

(*e*) *General.*—Regular labourers in the Water Department and on gas-mains to be, wherever possible, put on a weekly wage calculated on the present hourly rate. Men liable to broken time through weather to have 1s. per week bonus from the first Thursday in November to the last Thursday in February. This to apply to 6d., 6¼d., and 6½d. men.

Where not otherwise provided as above, the old rates and hours of labour to remain as before.

All the men now temporarily engaged to be withdrawn, and the men on strike to be reinstated so far as required, but so that no men on strike be excluded by labour engaged since the strike began.

It is understood that reorganization economies and seasonal causes will, in all probability, necessitate a reduction in the number of men required.

The new rates of pay for the skilled workers at Blackburn (referred to above as "the Oldham rate of pay") are as follows, and, as already pointed out in the "JOURNAL," were offered to the men seven weeks ago and refused by them.

Machinemen.—To be advanced to 5s. 10d. per shift—an increase of 6d. per shift.

Attendants.—To be advanced to 5s. 7d. per shift—an increase of 3d. per shift.

Firemen.—To be advanced to 5s. 7d. per shift—an advance of 3d. per shift, and in some cases (Addison Street works), 7d. per shift.

Pipemen.—To be increased to 5s. 7d. per shift—an advance of 7d. per shift.

The net result of the strike, so far as the gas workers are concerned, is that the Corporation abide by their offer in January to the skilled workers, and agree to increase the wages of the labourers from 24s. 6d. to 25s. per week; thereby adhering to their oft-expressed determination not to be coerced into paying more than the standard rate of wages for general labourers.

COMMENTS ON THE PEACE TERMS.

In the course of a brief interview with our Manchester correspondent, Mr. J. R. Clynes, M.P., said he was glad an amicable settlement had been reached. It was the earnest desire of the Union officials that Alderman Nuttall (the Vice-Chairman of the Electricity Committee) should not be subjected to any kind of personal feeling or ill-will. The officials felt sure there was no intention on the part of the Corporation to take advantage of any of the men because of the part they had played in the strike. He hoped that the spirit of goodwill would very soon return.

Alderman Nuttall agreed with this view, and said the strike had caused him much worry and anxiety. He had keenly felt the introduction of the personal element, and had often been wrongly blamed through a misconception of the proper position, and from the fact that he had but been the "mouthpiece" of the Council. He hoped both parties would work, as he would, for the maintenance of good feeling between the Corporation, its officials, and the men. In the end, the results of the strike would, he thought, be of advantage to the town. Among other benefits would be reorganizations and improvements in the management of the public undertakings.

A chilly note was struck by Councillor E. Porter, the men's Secretary, at a meeting of the local Trades' Council representing over 30,000 trade unionists. Mr. Porter said the Corporation terms were far from satisfactory, either to the officials or the men; but for reasons best known to them they had decided to end the strike. This did not mean, however, that the wage question was ended. They had always felt that their claim was a modest one, and that it had not received the attention that it deserved. It was thought better, however, to close the dispute now and re-open it on some future occasion that would suit their purpose. He trusted, however, that no further strike would be necessary.

THE SETTLEMENT CONFIRMED.

On the motion of Alderman Nuttall, the General Purposes Committee on Thursday unanimously confirmed the terms of settlement; several questions being asked in regard to the reinstatement of certain strikers.

The Mayor, in reply, assured his questioner that the Corporation would honourably carry out their promises; but a little time must necessarily elapse before the whole of the old employees could be re-signed for duty.

BULK OF THE STRIKERS RESUME WORK.

The bulk of the strikers resumed work on Wednesday and Thursday. Some slight misunderstanding occurred in respect of the gas workers who presented themselves early on Thursday morning. Not having "signed on," they were not allowed to start work; but the resumption was delayed only till two o'clock in the afternoon, by which time the imported men had left. On Saturday, however, the Union officials reported that no fewer than 110 of the 450 strikers had not been reinstated; and they said that this was causing considerable ill-feeling. Careful inquiries show that the Corporation have not taken up a deliberate policy of declining to reinstate the men; our Manchester Correspondent being informed that during the strike all municipal work had become disorganized, and it would take some little time before matters became normal. A section of the men complained that the settlement was not being carried out in the spirit in which it was intended; and they asserted that servants of many years' experience had not been given their old occupations, but had been drafted into new work. The strikers' funds have been depleted to the extent of nearly £2200 in strike-pay alone; while a reliable authority places the total loss to the community at well over £100,000.

THE UNION'S NEW MOVE.

At another meeting of the local branch of the National Union of Gas Workers and General Labourers, a resolution was carried instructing the Executive to make a general demand for a minimum of 6d. per hour for all labourers engaged by engineering firms in the town. The Executive Committee met later, and agreed to present the demand.

GAS PROFITS AND DEAR COAL.

[From the "Daily Telegraph."]

The market for gas stock is seldom subject to commotion. It is essentially an investment market. The various classes of stock are held for the yields they offer; and the regularity with which the dividends are paid justifies its stability.

Gas companies occupy a somewhat privileged position as trading enterprises; for excluding the competition of the electric lighting companies, they have no rivals. What they may lose from the change over to electric lighting by consumers, they more than make up by the increased consumption of gas for domestic purposes. Again, when the cost of materials encroaches on profits, the obvious course is adopted of raising the price of the product; and but for the fact that the general set-back in trade is expected to involve a reduction in the price of coal, consumers of gas would now have to face a rise in the price per 1000 cubic feet.

This is the burden of the gas company reports issued within the past few weeks. In fact, it is about the only point on which the directors comment. The South Metropolitan Directors, who have been affected by the abnormal cost of coal, consider the hardship to be entirely due to the unprecedented export of coal, and think that an export-tax would be justifiable. The South Suburban Company likewise lament the increased cost of coal, and the bad price obtained for residuals. All the same, though profits are generally lower, when dividend is set against the dividend for the corresponding period, the stockholder has not suffered. The following results are from the recently issued reports:—

	1913.		1912.	
	Net Profit. £	Dividend. Per Cent.	Net Profit. £	Dividend. Per Cent.
Brentford	34,592	(new) 11	56,647	11
Commercial	56,949	£5 9 4	70,946	£5 9 4
Gaslight and Coke	443,988	4 17 4	505,177	4 17 4
South Metropolitan	116,910	5 9 4	144,023	5 9 4
South Staffordshire Mond Gas	4,296	1¼	8,352	2½
South Suburban	26,425	6	13,391	6
Tottenham Light, Heat, and Power	14,716	(B) 5⅝	18,672	(B) 5⅝

When the circumstances of the industry are taken into consideration, the yield of over 5 per cent. which the stocks of these concerns usually offer gives the group attractions for those who like an industrial which yields a steady return with slight fluctuations in the price. The recent recovery in market values has hardly affected gas stocks; and several of the issues are five points below their average level.

More Vertical Retorts for Bradford.—A unanimous decision was come to by the Bradford Corporation Gas Committee, at a meeting last Tuesday, to recommend the Council to extend the vertical retort installation at a cost of £117,000. Some two years ago 64 Glover-West vertical retorts were put down at the Thornton Road works; and they have, it is stated, fulfilled all expectations. The new installation is for the Birkshall works, and will have two-and a-half times the capacity of that at Thornton Road. It will carbonize 400 tons of coal and produce 5 million cubic feet of gas per day.

SUBSIDENCE AT CRADLEY HEATH.

A Serious State of Affairs.

The disadvantages suffered by gas and water undertakings carrying on operations in mining districts are well exemplified by subsidences which occurred last Thursday at Cradley Heath. The High Street—the principal thoroughfare in the place—was practically wrecked, and damage estimated at £20,000 was caused, by the fall in the level of the street. Within a distance of about 200 yards, some forty shops were rendered uninhabitable; the subsidence in some parts of the roadway being as much as 6 feet. In the ordinary way, ground disturbances do not trouble the inhabitants of towns like Cradley Heath—under which are colliery workings—but this was something quite unusual. On Monday there were cracks in the footpath; and on the two following days these widened into fissures. Then on the Thursday morning came the sinking of the ground—as suddenly as if it had been caused by an earthquake shock.

Happily, no case of personal injury was reported; but the tramway service was dislocated. It is reported also that the Cradley Heath Gas Company found their mains utterly "out of joint"—so much so that it was dangerous at one time of the day to light a match in the roadway. The gas supply was cut off for a considerable time during the day; and the water supply was in little better case.

Messrs. David Parsons and Sons, Limited, the colliery owners who are believed to be chiefly concerned, have issued a statement in which they say that "the mines have been worked on the most modern and approved system, in order to afford all reasonable support to the surface, and avoid all damage to buildings; and strong ribs of coal have been left over the whole area, amply sufficient, under all circumstances which could have been foreseen, for the security of the surface. The present subsidence is due to circumstances which could not have been foreseen, and over which the Company have no control, and the explanation of which is of a technical nature. The Company have entirely closed work under the affected area; and when in the course of a short time a settlement of the surface has taken place, no further damage is to be anticipated, and the buildings can be quite safely repaired. No indications whatever showed themselves in the mine until the last few days; and up to the actual time of the occurrence, nothing was further from the minds of the Directors than that such a subsidence should have occurred."

A deputation has been appointed to interview the firm on the subject of compensation; and a mining engineer is to be engaged to inspect the workings.

During Thursday night the subsidence continued; and the following day great expedition was shown by people in the affected area in the removal of their belongings. The Gas Company, the South Staffordshire Water Company, and the Electricity Company all had men at work, endeavouring to maintain supplies. There was a large escape of gas; and so the big main was cut off, and a smaller one laid along the surface to take the gas through the disturbed street. The Water Company laid 8-inch steel pipes to replace the old mains which it was feared had been damaged. During the moving, two men were overcome by the escaping gas; but after treatment they recovered. Later on, too, the water-main burst; but the supply was very soon cut off. Though mining subsidences have been common enough in the Black Country, never, it is said, has one occurred so suddenly, and with such dire effect, in a busy and prosperous area.

BIRKENHEAD GAS SUPPLY.

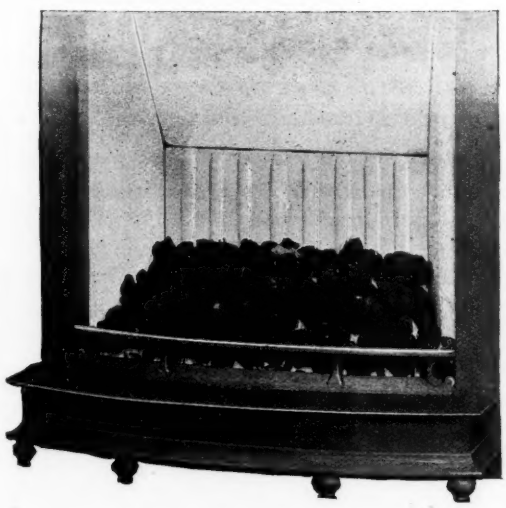
The Local Government Board inquiry into the application of the Corporation of Birkenhead for a Provisional Order to include seven adjoining urban and rural districts within the borough, was continued last week at the Town Hall before Mr. H. Shelford Bidwell, M.Inst.C.E. Evidence was given by the Borough Treasurer (Mr. Thomas Sumner) as to the finances of the town; and by the Gas Engineer, the Electrical Engineer, and the Chief Constable, with regard to the equipment of the borough. The Gas Engineer (Mr. T. O. Paterson) pointed out that all the outside districts, except Storeton, were now supplied with gas by the Corporation; and applications had been received from Bromborough, where works were being established, for a service from the Birkenhead Gas-Works. Friday was the ninth day of the inquiry.

Mr. Paterson, in the course of his evidence, said that the trunk mains from the Birkenhead Gas-Works extended to Bidston Village, Noctorum, Prenton, Higher and Lower Bebington, and right down to Bromborough; so that all the districts sought to be incorporated, except Storeton, were in the borough gas supply area. There had been a steady growth in the consumption of gas. In 1859 there were 2600 consumers; and in 1913 the number was 30,000. Notwithstanding the use of electricity, the gas consumption had doubled itself in the last ten years. They were now laying a high-pressure main from the storage works in Laird Street, which would be brought into operation this year. There was development going on in the Bromborough district, from which applications for gas had been received; and there were also negotiations going on with manufacturing firms for a large supply. At Lower Bebington the demand was increasing residentially and industrially. There would be no difficulty in giving an increased supply for a number of years with their existing appliances.

In reply to the Inspector, who inquired what guarantee the Corporation required from various applicants in Bromborough for the supply of gas, Mr. Paterson said they asked for five years originally; then they reduced it to three years' supply. If the district does not take the quantity guaranteed, they have to pay the full amount of the outlay for mains, &c.

At an auction sale at Torquay, five £10 shares in the Torquay Gas Company, entitled to a dividend of 7 per cent., realized £15 each.

MAIN'S "ST. HILARY"



Gas undertakings are sometimes asked to fit a Gas Fire into a grate of the "well" fire type. The "St. Hilary"—which is an adaptation of the well-known "St. Nicholas"—has been specially designed to suit this type of grate and will be found eminently suitable and satisfactory.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

BERLIN CORPORATION GAS UNDERTAKING.

Report for 1912.

The "Journal für Gasbeleuchtung" for Feb. 7 gave the official report of the working of the municipal gas-works of Berlin for the year 1912, from which we now extract some particulars.

The number of consumers increased considerably during the year; 54,716 slot meters and 6067 ordinaries having been added, bringing the totals up to 149,841 and 289,102 respectively. The gas sold increased by 16,648,102 cubic metres [588 million cubic feet]. The total gas consumption was 320,470,000 cubic metres [11,319 million cubic feet] —an increase of 20,808,200 cubic metres [nearly 735 million cubic feet], or 6½ per cent. Prepayment meters alone passed 39,530,352 cubic metres, or over 12 per cent. of the total. Coal was purchased somewhat cheaper than in the previous year, and coke commanded better prices. From 854,301 metric tons of coal were produced 276,412,700 cubic metres [nearly 9762 million cubic feet] of coal gas, or about 11,400 cubic feet per ton. From 31,515 tons of coke and from 10,083 tons of oil were produced 44,126,300 cubic metres [1558½ million cubic feet] of water gas. The gas consumption works out at 153 cubic metres [5403 cubic feet] per head of population; and, reckoning the Imperial Continental Gas Association sales, the figure per head for the whole city is 177 cubic metres [6252 cubic feet]. Both these show an increase on the previous figures. The highest output for one day was 1,453,400 cubic metres [51,334,000 cubic feet] on Dec 14. The public lighting consumption was 11·8 cubic metres [417 cubic feet] per head of the population. The net profit realized on working amounted to Mk.16,744,700 [£820,118].

The report states that tar commanded enhanced prices, and ammonium sulphate and liquor were very satisfactory. Retort carbon was also in good demand. Coal was scarce in the first three months of the year, and German coal was dear all through. Only 21·4 per cent. of all the coal consumed was of German origin—an increase of 3·4 per cent. in English coal. In the first six months more water gas was used, owing to the high coal prices; but the greatly increased price counteracted much of the benefit. Horizontals, verticals, inclines, and chambers were all used in the production of gas. The quality of the gas never fell below the statutory limits, and the mean gross calorific power was 5300 calories per cubic metre [595 B.Th.U. per cubic foot]. The daylight consumption of gas was 42·4 per cent. of the total.

The coke production was 607,099 metric tons, or nearly 72 per cent. of the coal carbonized. With the 37,657 tons in store on April 1, and the 25,617 tons recovered from clinker, 670,374 tons of coke were available altogether in the year. Of this, 150,696 tons were used in the producers, 52,455 tons (mostly dust) for boiler firing, 31,515 tons for the water-gas producers, and other smaller quantities bringing the total up to 272,186 tons. Coke sales amounted to 374,659 tons. The coal tar production was 39,436 tons, or 101 lbs. per ton of coal, and 2306 tons of water-gas tar. From 103,618 tons of ammoniacal liquor produced, 5491 tons of sulphate and 3192 tons of concentrated liquor were turned out by the ammonia works. The highest number of men in the employ of the undertaking at one time was 6839. The length of mains was increased during the year by 104,807 metres [over 65 miles]; three new suburbs having been connected.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

A case has been heard, before the Court of Session, in Edinburgh, in which the Glasgow and South-Western Railway Company were defendants. A passenger claimed £2000 damages for an accident which he asserted was due, among other things, to faulty lighting of their Prestwick Station. For the Railway Company tests had been made with a portable photometer showing that a lamp, which was only 20 feet away from the place where the pursuer fell, gave a light of 0·18 candle foot, and that the 3-light electric lamp in the carriage added a further light of 0·83 candle foot. It was also shown that this was much above the average, even for well-lighted stations. In spite of such evidence and much more of a simple nature, such as would be easily understandable by a Jury, they awarded £300 damages to the pursuer. In the course of the litigation, it was brought out that on several of the Scottish Railway Company's lines there are a number of stations which are still lighted by the old flat-flame burners, and also many where the oil-lamp is in use. It may be thought that the latter method only obtains in the country districts, where there is no gas supply; but there are many places where gas is seen in the roads and approaches to a station, but where the platform itself is still only dimly lighted by oil-lamps. In the event of an accident at one of these stations, the fact that gas was available but not used would go hardly against the company concerned for not taking every advantage of the means at hand for adequate lighting.

The retort-house hands at Falkirk have been applying for an increase in wages, and the Convener and Manager have been deputed to inquire as to the wages paid at other gas-works, and report. A layer of oil is being put on the surface of the water in the gasholder tanks to try and cure naphthalene troubles, and results will be looked forward to when the report comes up a month hence. The method does not appeal to one, as, when green oil has been used for the absorption of naphthalene, it becomes in time like cart grease, and the state of the inside of the holder when this happens may be imagined.

As mentioned in these notes before, the Town Council of Inverkeithing have adopted the Burghs Gas Supply (Scotland) Act, and are now obtaining advice as to the price to be offered to the local Gas Company for their undertaking. In view of this, the annual meeting of the shareholders is more than usually interesting. It was reported

Richmond's 'IRONCLAD'

A Gas Heated Circulator for hot water supply, to be continuously successful in every-day use, must of necessity be simple in constructional principle.

FIRST, to avoid deposit the gas-way should be entirely free and unimpaired by baffles, which are generally cumbersome and inaccessible.

SECOND, the water-way must be mainly vertical to allow of gravitation of sediment formation and to maintain the efficiency. Heat baffles and horizontal water-ways are the surest means of forcing a high gas consumption to obtain the duty originally specified.

THIRD, the heating area should be ample for quick service and the circulator large enough for the domestic requirements.

The "IRONCLAD" has every known good point to recommend it for complete satisfaction to the user and to the Gas Undertaking.

THE Richmond GAS STOVE & METER Co LTD

WARRINGTON & LONDON.

that the gross profits for the year amounted to £736 17s. 2d.; while the net profit, after charging depreciation and other expenses, was £584 15s. 8d. The dividend recommended, and decided upon, was at the rate of 8 per cent.; and this left £193 19s. 10d. to be carried forward. Mr. Thomas Plant, Assoc.M.Inst.C.E., the Chairman, in referring to the question of purchase by the Town Council, said that they had appointed a good man to value the undertaking, and the Company also intended to have at least as good a man. They hoped thereby that a mutual agreement would be come to which would give to each party a satisfactory result, and so avoid an arbitration. The Company were anxious to proceed amicably in all their relations with the Council.

The Catrine Gas Company, Limited, have unanimously decided to erect a gasholder, to cost about £1000, on ground belonging to them at Bridge Street.

The Girvan Gas Company have decided to make use of their present coal-store for an extension of the retort-bench. A new coal-store which is to be built will run parallel with the bench. It is estimated that the cost of this extension, which is rendered necessary owing to the continued increase in the consumption of gas in the town, will be about £2000.

Owing to the pressure of water in the gas-mains in the east end of Port Glasgow, the streets in some parts were thrown into semi-darkness, and shopkeepers in the affected district had to resort to candles. In the Bay area the supply of electric light also failed, owing to the stoppage of the gas-engine which provides the power for the generating plant. The trouble only lasted for about one hour.

The Dumbarton Town Council held a special meeting to resolve that a Provisional Order should be promoted for the purpose of obtaining, among other things, additional borrowing powers for gas purposes. The Council approved of the recommendation, and remitted the matter, with full powers, to a Committee.

If "in a multitude of councillors there is wisdom," then the Kirkcaldy Town Council should by now have been made wise as to the extension of their gas undertaking. First they had a report by their Manager, Mr. Kincaid, then one from Mr. Herring, again the Town Chamberlain, Mr. Maxwell, reported, and now there is one from Mr. R. Cockburn Millar, C.A. Mr. Millar opens by questioning the powers of the Town Council to borrow money under the Burgh Gas Supply (Scotland) Act, 1876, to pay for the whole cost of new works to take the place of existing works. If such powers are available, then, by extending on the present site, he estimates a saving, after the third year, of 3d. per 1000 cubic feet. If the new works are erected on another site, the price of gas would be increased by 1d. per 1000 cubic feet the first year, 4d. in the second year, and 4½d. in the third year. When the works were completed in the fourth year, an estimated ultimate saving of 2½d. per 1000 cubic feet would then be realized. If the present works were continued, and a three-quarter million works erected on a new site, this would require an increase of ½d. per 1000 cubic feet in the first year, 3d. in the second year, 3½d. in the third year, and when the new works came into operation the ultimate saving would be about ½d. per 1000 cubic feet. But the Act requires that all renewals, however great, must be charged to revenue. Then the increased profits, according to Mr. Kincaid, will be sufficient during the three years to cover the value of all the superseded plant, and an increased price to meet the interest and sinking fund for the new plant only will be required—viz.: In the first year (say), 1d. per 1000 cubic feet, second year 2½d., third year 4¼d., fourth year 2½d.; or, averaging the requirements over the four years, 2⅛d. per 1000 cubic feet. After the completion, the extra profits will allow a reduction of about 3½d. per 1000 cubic feet. In the event of the entirely new works, the additional price of gas would amount, on the average, to 11¼d. per 1000 cubic feet, and an anticipated saving, after completion, of about 6d. per 1000 cubic feet. For the third proposal, Mr. Millar contents himself by referring to Mr. Kincaid's report that the scheme had very little to commend it. He refers to the Town Chamberlain's observations regarding the loss of rating if the works were erected outside the burgh. The sting of his report is in the tail, where he says he has not been able to find any authority for the first alternative; and as Auditor he would feel it his duty, as at present advised, to report that such an application of money borrowed was altogether contrary to the statutory provisions.

CURRENT SALES OF GAS PRODUCTS.

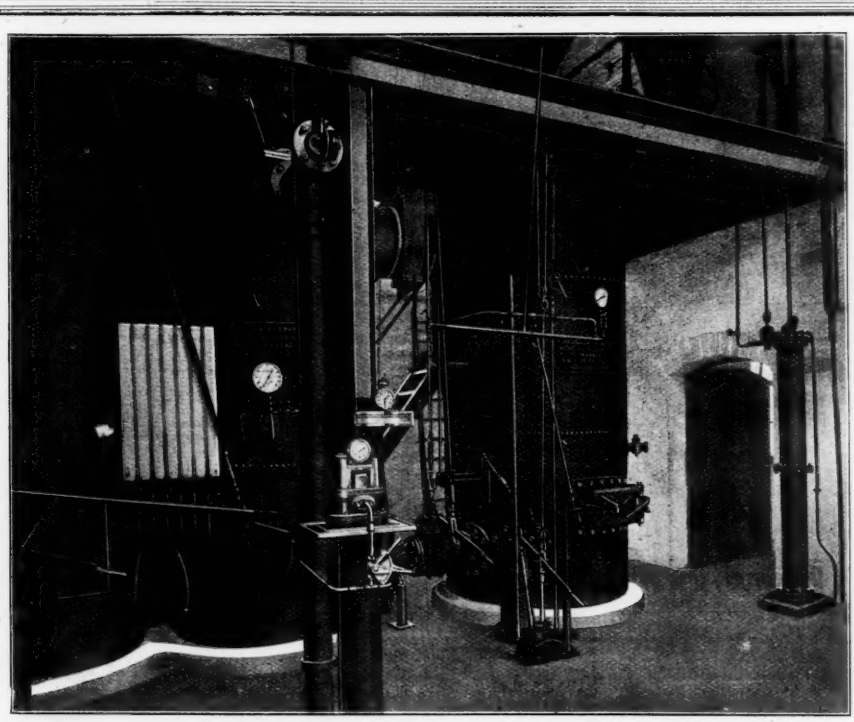
The London Market for Tar, Tar Products, and Sulphate.

Tar products have for the moment got into rather a rut, and little business is being done in them with the exception of pitch, which has been fairly active, and prices ranging from 39s. 3d. to 39s. 6d. net have been paid and refused. Sales of creosote continue at 3⅜d. net, and even a somewhat higher price has been obtained in quantity. Solvent naphtha, 90 per cent. toluol, 90 per cent. benzol, 60° crude carbolic acid, and anthracene remain at the last reported prices.

There is rather a lull in sulphate of ammonia, and the price stands at £12 2s. 6d. sellers, and £12 buyers, for 25 per cent. quality, net and naked, at the works.

Tar and Tar Products in the Provinces.

The average values during the week were: Tar, 26s. 6d. to 30s. 6d. Pitch, east coast, 38s. 9d. to 39s. 3d.; west coast, Manchester, 37s. 6d. to 38s.; Liverpool, 38s. 6d. to 39s.; Clyde, 38s. 6d. to 39s. Benzol, 90 per cent., naked, North, 11½d. to 1s.; 50-90 per cent., naked, North, 11d. Toluol, naked, North, 10¾d. to 11d. Crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 9¼d. to 9¾d. f.o.b. Heavy naphtha, naked, North, 9d. to 9¼d. f.o.b. Creosote, in bulk, North, 3d. to 3¼d. Heavy oils, in bulk, 3⅝d. to 4d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 0¾d. to 1s. 1d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags



DEMPSTER'S BLUE AND CARBURETTED WATER-GAS PLANTS

for

EFFICIENT and ECONOMIC WORKING.

For Particulars apply to:

R. & J. DEMPSTER, Ltd.,

Tel. Address "SCRUBBER, MANCHESTER."

Gas Plant Works, MANCHESTER.

included. Anthracene, "A" quality, 1½d. to 1¾d.; "B," nominally ¾d. per unit, packages included and delivered.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *Feb.* 21.

Although the advance has not been so rapid as that recently experienced, the tone of the market has been strong throughout the week, and quotations are again higher at all the ports. There has been more inquiry from buyers abroad, and the home trade has now begun to make its presence felt. The nearest values at the close are £12 12s. 6d. per ton f.o.b. Hull, £12 13s. 9d. per ton f.o.b. Liverpool, and £12 15s. per ton f.o.b. Leith. No transactions have been reported for delivery over the distant months, the ideas of buyers and producers having evidently been too divergent to admit of first-hand business being put through.

Nitrate of Soda.

The market for this material is steady, and values are well maintained at 10s. 6d. per cwt. for ordinary quality, and 10s. 9d. for refined, on spot.

From another source it is reported that there has been a little improvement in the market for sulphate of ammonia during the past week, and at the present moment the market is very steady. Outside London, makes are £11 15s. to £11 17s. 6d.; Hull, £12 10s.; Liverpool, £12 10s. to £12 11s. 3d.; Leith, £12 12s. 6d.; Middlesbrough, £12 10s.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade seems quieter, especially for forward delivery. For steam coals, best Northumbrians are steady for prompt supplies, with prices varying from 13s. 3d. to 13s. 9d. per ton f.o.b. Second-class steams are from 11s. 6d. to 11s. 10½d. per ton; and steam smalls are from 6s. to 7s. 6d. For forward delivery, quotations are irregular, with a limited demand, though some Swedish contracts now in treaty may better define the prices. In the gas coal trade, current quotations are based on best Durhams at 13s. 4d. to 13s. 6d. per ton f.o.b.; and second-class gas coals are about 11s. 9d. to 12s. 3d. per ton. "Wear specials" are from 13s. 6d.; the demand being rather fuller. A number of small contracts for Veile and several Danish towns are in the market. As to the rumoured sales of large quantities of German gas coals to London Companies, in place of Durham coals, less is now heard; and the belief seems general that the quantity sold has been much exaggerated by rumour. A contract has been closed for some 34,000 tons for Malmo, and the price delivered there is believed to be about 17s. 3d. per ton. Others are in treaty; but buyers look for concessions in price, and settlements of contracts are only slowly made. Coke is steady. Good gas coke is from 13s. 3d. to 13s. 9d. per ton f.o.b. in the Tyne.

From "Bell's Weekly Messenger."

FEB. 20, 1814.

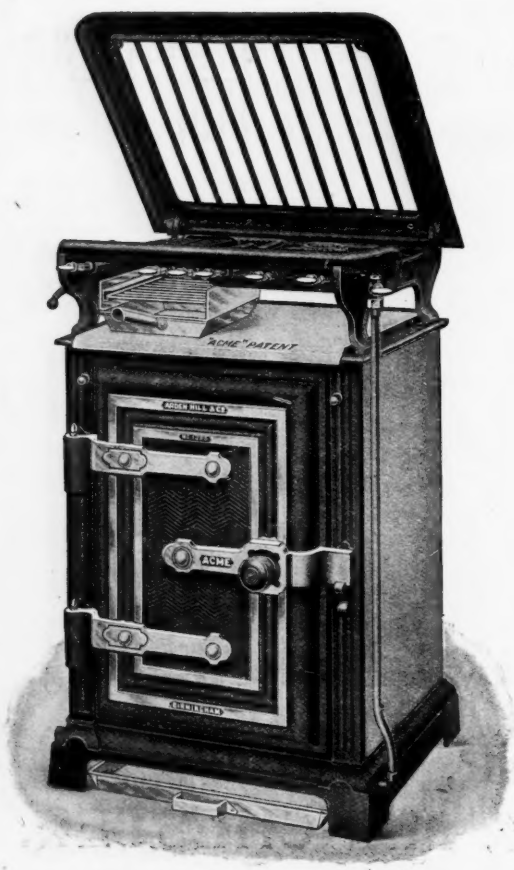
We are glad to hear that the gas-pipes in Peter Street and Norton Folgate are intended to meet at Temple Bar; so that the inhabitants in the principal streets, from the extremities of London and Westminster, will soon enjoy the fruits of this fine invention. Westminster Hall, the avenues, staircases, &c., of the Parliament House, and all the streets adjoining, are prepared for lighting, we understand, as soon as Parliament meets.

The Macclesfield Vertical Retort Installation.

"There is," the "Macclesfield Times" understands, "unqualified satisfaction in the Gas Committee with the way in which the difficulties in regard to the vertical retorts are being overcome, and with the economies which will result from the working of the new plant. The latter have already manifested themselves; and rosy estimates are being formed as to the profits for the present and coming years. Coal is several shillings a ton cheaper now than last year, working expenses have gone down tremendously, the yield of coke is considerably greater (for one reason because the heating of the new retorts requires much less coke than the old ones), and other residuals are bringing in greatly enhanced revenue. All these are gratifying facts, which cause members of the Gas Committee to feel that the heavy expenditure has been fully justified, notwithstanding the brief period of loss and inconvenience which it entailed." Mr. William Newbigging (the Engineer) recommends the provision of greatly increased coal and coke storage accommodation at the works, and other improvements; and he is to prepare a report on the subject for consideration by the Committee.

Manchester and Failsworth Amalgamation Scheme.

The ratepayers of Failsworth were asked last Saturday to approve the terms of amalgamation provisionally agreed upon as the result of several interviews between the Manchester Parliamentary Sub-Committee and the Failsworth Urban District Council Amalgamation Sub-Committee; one of the clauses of the agreement being that Manchester undertakes within five years to effect a transfer of the gas and water supply of the district from the Oldham Corporation, and afterwards to supply these commodities at Manchester prices. The polling, however, shows that Failsworth has declined to join either Manchester or Oldham. A good deal of interest was taken in the poll as to, (1) whether the district was in favour of amalgamation; and (2), if in favour, with which district—Manchester or Oldham. There were 3367 persons entitled to vote, though less than one-half went to the poll. The results were: In favour of amalgamation, 465; against, 1011; majority against, 546. On the second question, as to which authority Failsworth should join, had amalgamation been agreed to, the figures were: In favour of Manchester, 670; in favour of Oldham, 197; majority for Manchester, 473.



THE . .

"Super-Acme"
Gas Cooker.

Where other high-grade Cookers end is the starting point of the "Super-Acme." The "Super-Acme" is not another ordinary Cooker; it is the highest point yet reached in high-grade Gas Cooker Construction.

SOME NOTABLE FEATURES.

Extra large oven.

Hinged and improved hotplate; taps in front; wrought-iron top bars.

Porcelain enamelled inside and out.

Nozzle outlet at back, leaving clear space on top of oven for loose enamelled tray.

All parts are standardized and are not nominally but **actually** interchangeable.

ARDEN HILL & CO.,
"Acme" Works,
BIRMINGHAM.

A Sanatorium Lighting Contract.

A dispute has arisen between the Exeter Gas Company and the Exeter Insurance Committee. The latter, anxious to provide sanatorium benefit at the earliest possible moment, entered into a contract with the Gas Company to supply light at the isolation hospital, which had been designated as a sanatorium. But the Act forbids the Insurance Committee to incur capital expenditure. This is the province of the Exeter City Council. When the City Council moved, however, they declined to ratify the gas contract—preferring to instal their own electric light. The Gas Company insisted upon the contract being carried out, or, alternatively, that they should receive compensation for the profit that would have accrued from the seven years' agreement. The Insurance Committee are prepared to reimburse the Company the cost of the cartage of the gas-pipes to Pinhoe and their removal back to Exeter; but this the Company refuse.

Storage Extension required at Wellingborough.—Alluding to the financial results of this Company's working for the second half of last year, as shown by the accounts submitted to the shareholders yesterday (Monday), the Directors point out that additional gasholder accommodation must be provided, entailing a considerable charge on the revenue account, as the existing single-lift 80-feet holder which has been in use for forty years will be removed and a three-lift holder put in the same tank. It will probably be decided to do this during the summer of next year.

The New Retort Plant at Chester.—The speech of the Chairman of the Chester United Gas Company, Mr. Alderman Frost, the Mayor, when moving the adoption of the report noticed in last week's issue (p. 454), gave some particulars as to the new carbonizing plant now under construction at the works. He said it was over twelve years since they introduced the manual machines now in use; and they had had some excellent results from them. They were, however, very heavy to work; and unless the Company were able to buy on favourable terms coals of a quick and easy carbonizing character, the existing machines and arrangement of the retorts did not work economically. Since they bought the machines, there had been many great improvements in charging apparatus; and they would now be able to enlarge the retorts by making two single ones into one through retort, and leave the charges a longer time in the retort. The machines would do all the work other than opening and closing the retort-lids. There would be economy in labour sufficient to justify the expenditure involved. But more valuable advantages would be gained by being able to use a larger variety of coals, and more perfect carbonization would be secured with the longer charges. Besides all this, there was the very considerable relief which would be afforded to the men engaged in the house, as a sure means of gaining greater efficiency in their work. They were hoping to have the new machines in the retort-house in operation by June next.

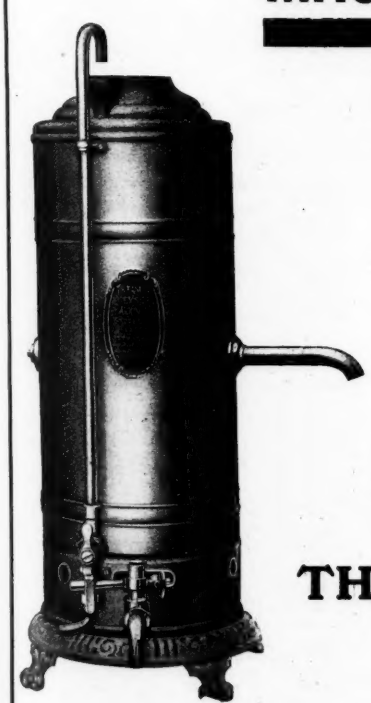
A Belated Back-Dividend.—The Directors of the Leatherhead and District Water Company, at the half-yearly meeting of the shareholders last Wednesday, recommended the payment of full dividends on the £54,000 of capital and "the payment of a dividend at the rate of 5 per cent. per annum on account of the deficiency of the maximum dividend for the half year to Dec. 31, 1886, on the share capital paid up at that date"—27 years ago.

Redhill Co-Partnership Scheme.—The rules of the co-partnership scheme drawn up by the Engineer and Manager of the Redhill Gas Company (Mr. W. H. Bennett), and adopted by the Directors, were fully explained to the employees at a meeting held last Tuesday. Representatives of the men and of the office staff took advantage of the opportunity to thank the Board for the step they had taken. Particulars of the scheme were given on p. 382 of the "JOURNAL."

Sidmouth and Prepayment Installations.—At a special meeting of the Sidmouth Urban District Council last Wednesday, the Gas Committee, in a report they submitted, recommended the Council to fit up gratuitously prepayment installations wherever it was thought the consumption would justify the expense. The Committee suggested that provision be made for fitting up 400 houses free of cost with meters, cookers, and one light in each of three rooms (or a hall light and two rooms) on the ground floor. The estimated cost of the scheme, they said, was £2465; and the charge for gas would be at the rate of 1d. for 17 cubic feet. The Committee were of opinion that the average yearly consumption per house would be about 11,000 cubic feet; and on this basis the interest and repayment of the necessary loan would be easily met. The report was referred back for further consideration.

Inefficient Public Lighting.—Referring to this subject in a recent number of the "Sanitary Record and Municipal Engineer," the writer of "Cross-Table Chat" pointed out that "in some towns the ancient fishtail burner, consuming 5 cubic feet of gas per hour, which gives only some 15-candle power efficiency, is still perpetuated, when inverted incandescent burners, consuming 4 cubic feet per hour and yielding an illuminating power of 145 candles, should be substituted. Again, where vertical incandescent burners have been adopted, old types are still retained consuming 4 to 5 cubic feet of gas per hour, and giving a lighting efficiency of some 40-candle power, when a new type is on the market, consuming less gas, giving an efficiency of three times the power. Moreover, we have had to observe with some astonishment that incandescent burners are frequently neither properly regulated nor cleaned, with the result that the mantles are rarely incandescent, and the lighting efficiency is consequently reduced from 40 to 20 candle power. In addition to the neglect of the burner, it is far too commonly observed that the lanterns are of a very old and unsuitable type, where the light is not reflected to the pavement where it is required, but disseminated overhead. The spacing of the lamps, too, is highly unsatisfactory. . . ." The writer considers the condition of some public street lighting is far from creditable to local authorities and the officials responsible for it.

MAUGHAN'S NEW TREASURE GEYSER



An Important Improvement.

As will be seen by the illustration a plug is fitted on opposite side to outlet, enabling "HAND" to be readily changed.

When required the extra outlet can be arranged to supply lavatory in addition to bath.

ANOTHER REASON FOR USING "PARKINSON" WATER HEATERS.

THE PARKINSON STOVE Co., Ltd.

(Incorporating Maughan's Patent Geyser Co.)

BIRMINGHAM AND LONDON.

Labourers' Wages at Bury.—The Bury Gas Committee had before them last week a letter from the Bolton and District Gas Workers' Association asking for 1s. a week increase in the wages of labourers employed in the gas-works and mains department. The question was adjourned for a month, for information to be obtained from other towns.

Corroded Screws "Spring" a Meter.—Mrs. Elizabeth Nixon, an aged Preston woman, was found dead on Saturday in a chair; the room being full of gas. At the inquest later in the day, an Inspector of the Gas Company said the front plate of the meter had "sprung," probably through corrosion of the screws. The Jury found that the woman died accidentally, from suffocation.

Price of Gas at Blackpool.—A reduction in the price of gas to all classes of consumers is on the *tapis* at Blackpool. At the next meeting of the Gas Committee, an attempt will be made to get the price reduced from 2s. 2d. to 2s. per 1000 cubic feet. A corresponding advantage to the prepayment consumers is advocated; while there is also the possibility of the Committee making a special bid for large consumers. The present move is attributed to the Electricity Committee's new tariff.

Suicide by Gas at Doncaster.—A verdict of "Suicide during temporary insanity" was returned by a Coroner's Jury who inquired into the death at Doncaster of Mrs. Rands, a school teacher. Evidence showed that deceased, who had been suffering from nervous breakdown, was found with a pillow over a gas-bracket and also covering her head; the gas being turned on. When the doctor arrived, the body was still warm, and he sent to the infirmary for some oxygen, though without avail.

The London County Council and High-Pressure Meter Testing.—At last Tuesday's meeting of the London County Council, the report of the Parliamentary Committee with reference to the testing of high-pressure gas-meters [see "JOURNAL" for Dec. 23, p. 956] was received, and the recommendation to promote the Bill adopted—74 members voting for it and none against.

Banbridge Gas Explosion.—Mr. R. Shooter (the Chairman of the Banbridge Urban Council) presided at a public meeting in the Town Hall on the 16th inst., at which Hugh Adamson was presented with certificates and cheques from the Carnegie Hero Fund and Society for the Protection of Life from Fire, in recognition of his bravery in rescuing the late Mr. G. Mearns (the Manager of the Banbridge Gas-Works) from a burning building on the occasion of the explosion at the works last December. Mr. Shooter and others spoke in high praise of Adamson's bravery.

Ashborne Gas-Works Purchase.—The Ashborne Urban District Council have secured a loan of £49,000 to pay for the gas-works, which they lately acquired by arbitration. It is stated that, out of the £49,000 cheques have been drawn for £46,853, made up as follows: Amount of award, £39,667; other payments to the Company under the Council's Act, £3420; Umpire's fees, £513; Mr. H. G. Harrison's compensation, £1000; Mr. H. Wright's compensation, £450; costs of obtaining loan and duty, £428; and Company's costs of arbitration, £1374. In addition, there was a sum of £406 due to the Company in respect of interest on the purchase money and in repayment of employees' wages since Dec. 31. Mr. Harrison was the Company's Works Manager, and Mr. Wright occupied the position of Secretary and Collector.

GAS COMPANIES IN THE STOCK EXCHANGE.

The week just concluded has been a gloomy one on the Stock Exchange—depressed from start to finish. A variety of causes may be cited. In the first place, the remarkable recovery last month was a great deal over-rushed, and the recoil from wild speculation is now being felt. Politics both at home and abroad (especially in France) are disquieting; and the public are shy, and prefer not to be taking anything just at present. The Money Market, too, is harder. The upshot of it all is that prices in every market have shrivelled, and Consols actually went down 1¼ in the week. A disheartening start marked the opening day, and prices fell before general realization both at home and abroad. Gilt-edged articles were quite flat, and Consols dropped ½. Rails were freely offered, and Transatlantics were put down by American and Continental pressure. Foreign were weaker. Tuesday was sluggish and dull, and general weakness continued. Government issues gave way, but Consols closed unchanged. In Rails, falls preponderated; and American prices receded. On Wednesday the state of things was just the same; all departments being heavy and depressed. Government issues were still on the down grade, and Consols were ¼ lower. Rails were pressed at lower prices, and the rest generally (except Colonials) were down. Business on Thursday was very inactive, and the general tone was as dull as ever, prices dropping everywhere. Consols lost another ¼; and all the chief markets went the same way. Friday was dulness intensified—quite a gloomy day. Consols continued to score a loss of ¼ per diem. Rails were avoided, and a few realizations sent prices down again. Free Continental selling added to the general depression. Saturday brought no improvement, and all markets closed very dull. Consols did not move further, and closed at 75⅞-76¼. In the Money Market, rates hardened persistently. Business in the Gas Market showed no increase in point of volume, and brought no point of interest to view. Almost the whole of it was in the two biggest issues; and the remaining transactions were sprinkled about in ones and twos here and there. However, the general tone of the market was not at all bad, and some issues improved on their opening quotations. In Gaslight and Coke issues, the ordinary was moderately dealt in at slightly easier figures within the limits of 101⅞ to 102⅞—a loss of ½. The secured issues were very quiet, the maximum marking 75½ to 76⅛, the preference 96½, and the debenture 73. South Metropolitan was more than usually active, and changed hands at 110½ to 112, and the debenture realized 73⅜ and 74½. In Commercials, a deal in the 4 per cent. at 106, and two in the debenture at 72½ and 72⅜, was all. Among the Suburban and Provincial group, Brentford new was done at 209, British at 45⅝ and 45½ (a rise of ½), Tottenham "B" at 115½ and 116, and (on the local Exchanges) Liverpool "A" at 211½ (a rise of 1), and Newcastle at 103. In the Continental companies, Imperial fetched 175 to 176½, ditto debenture 84½, Union 80 and 81, and European 17⅞. Among the undertakings of the remoter world, Bombay realized 6⅛, Primitiva 6 11/16, ditto preference 5 3/32 to 5 5/32, and River Plate debenture 87½d.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE WEEK.

Bank Rate (fixed January 29), 3 per cent. Last year, 5 per cent. Consols, 75¾—76¼. Previous week, 77—77½.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 15	4	Alliance & Dublin Ord.	60–61	+2	6 5 0
374,000	,,	Jan. 15	4	Do. 4 p.c. Deb.	7½–81	..	4 18 9
280,000	5	Oct. 15	7½	Bombay, Ltd.	6–6½	..	5 15 5
50,000	10	Aug. 28	16†	Bourne-mouth Gas and Water } 10 p.c. B 7 p.c.	28½–29½	+½	5 8 6
354,500	10	,,	7		14⅞–15½	..	4 11 10
75,000	10	,,	6		13½–13⅝	..	4 7 3
380,000	Stk.	Aug. 14	14	Brentford Consolidated	365–368	..	5 4 6
330,000	,,	,,	11	Do. New	207–212	..	5 3 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	111–113	..	4 8 6
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	98–95	..	4 4 3
217,380	Stk.	Aug. 28	11	Brighton & Hove Orig.	201–206	..	5 6 10
244,200	,,	,,	8	Do. A Ord. Stk.	149–152	..	5 5 3
530,000	20	Sept. 26	12½	British	45–46	+½	5 8 8
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	90–92	..	4 7 0
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	89–91	..	4 7 11
100,000	10	—	—	Cape Town & Dis., Ltd.	2–3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	2½–4½	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	78–78	..	5 15 5
157,150	Stk.	Aug. 14	5	Chester 5 p.c. Ord.	109–111	..	4 10 1
1,513,380	Stk.	Feb. 12	5/3/4	Commercial 4 p.c. Stk.	105½–107½*	..	5 1 7
560,000	,,	,,	5½	Do. 3½ p.c. do.	103½–105½*	..	5 1 1
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	71–73	..	4 2 2
800,000	Stk.	,,	4½	Continental Union, Ltd.	79–82	..	5 9 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	117–122	..	5 14 9
492,270	Stk.	—	5½	Derby Con. Stk.	123–125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11
1,002,180	10	Jan. 15	10	European, Ltd.	17½–18½	..	5 8 1
16,386,660	Stk.	Feb. 12	4/17/4	Gas-light and Coke } 4 p.c. Ord. 3½ p.c. max. and 4 p.c. Con. Pref.	101½–103½*	−½	4 14 0
2,600,000	,,	,,	3½		74–77*	..	4 10 11
4,062,235	,,	,,	4		95–98*	..	4 1 8
4,674,850	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	72½–74½	..	4 0 6
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3½ p.c.	90–92	..	5 8 8
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16⅞–17½	..	6 7 6
131,000	Stk.	Sept. 11	7⅞	Ilford A and C	150–153	..	4 19 8
65,780	,,	,,	6½	Do. B	118–120	..	5 2 1
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89–91	..	4 7 11
4,940,000	Stk.	Nov. 13	9	Imperial Continental	174–179	..	5 0 7
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	83½–85½*	..	4 1 10
200,242	Stk.	Aug. 28	6½	Lea Bridge Ord. 5 p.c.	118–121	..	5 3 4
561,000	Stk.	,,	10	Liverpool United A	211–213	+1	4 13 11
718,100	,,	,,	7	Do. B	145–147	..	4 15 3
306,083	,,	Dec. 30	4	Do. Deb. Stk.	98–100	+1	4 0 0
63,480	Stk.	Dec. 30	3	Maidstone 3 p.c. Deb.	65–67	..	4 9 7
75,000	5	Dec. 11	6	Malta & Mediterranean	4⅛–4⅝	..	6 3 1
250,000	100	Oct. 1	4½	Met. of Melbourne } 4½ p.c. Deb.	98–100	..	4 10 0
541,920	20	Nov. 27	4	Monte Video, Ltd.	11⅜–12½	..	6 10 8
1,775,892	Stk.	July 30	4½	Newc'tle&G'tesh'd Con.	102½–103½	..	4 7 0
529,705	Stk.	Dec. 30	5½	Do. 3½ p.c. Deb.	82–83	..	4 4 4
55,940	10	Aug. 28	7/10/6	North Middlesex 7 p.c.	12½–13½	..	5 11 5
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	12½–12⅝	..	6 8 0
60,000	5	Sept. 26	10	Ottoman, Ltd.	7⅞–8¼	..	6 3 1
60,000	50	Aug. 14	18	Portsea, Island B	130–133	..	4 17 9
100,000	50	,,	12½	Do. C	120–123	..	4 17 7
249,980	5	Oct. 15	8	Primitiva Ord.	6⅛–7	..	5 14 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	5–5½	..	4 15 3
521,600	100	Dec. 1	4	,, 4 p.c. Deb.	93–96	..	4 4 3
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	87–89	..	4 9 11
275,000	5	Sept. 26	12	San Paulo, Ltd.	—	..	—
150,000	10	,,	6	Do. 6 p.c. Pref.	10⅛–11⅜	..	5 5 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	5 0 0		
135,000	Stk.	Aug. 28	10	Sheffield A	233–235	..	4 8 11
209,984	,,	,,	10	Do. B	23–235	..	4 8 11
523,500	,,	,,	10	Do. C	232–234	..	4 9 3
90,000	10	Oct. 15	7½	South African	10⅛–11½	..	6 10 5
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	110–112*	..	4 17 7
1,295,445	,,	Jan. 15	8	Do. 3 p.c. Deb.	73–75	..	4 0 0
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	159–161	..	5 5 7
952,795	Stk.	,,	6	S'th Suburb'n Ord. 5 p.c.	117–119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	112–114	..	4 7 9
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	113–115	..	4 6 11
594,740	Stk.	Nov. 13	5	Southampton Ord.	101–104	..	4 16 2
120,000	Stk.	Feb. 12	7⅜	Tottenham { A 5 p.c. B 3½ p.c.	135–138*	..	5 6 10
543,940	,,	,,	6½		114–116*	..	5 1 3
149,470	,,	Dec. 30	4	District { 4 p.c. Deb.	89–91	..	4 7 11
182,380	10	,,	5	Tuscan, Ltd.	5–6	..	8 6 8
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95–97	..	5 3 1
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	111–113	..	4 8 6
30,000	Stk.	Aug. 28	8⅜	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	155–160	..	5 4 8
255,636	,,	,,	6½	,, B 3½ p.c.	132–137	..	5 0 4
108,075	,,	,,	5/17/8	,, C 3½ p.c.	112–117	..	5 0 3
352,000	,,	,,	6½	Wimbledon 5 p.c.	111–116	..	5 5 7
98,000	,,	,,	6⅝	Epsom 5 p.c.	115–120	..	5 10 5
88,416	,,	Dec. 30	3	3 p.c. Deb. Stk.	71–73	+½	4 2 2

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

Bury Corporation and Gas-Fires.—At last week's meeting of the Bury Corporation Gas Committee, the desirability of supplying gas-fires on the hire-purchase system was considered. It was resolved that the system be adopted; the fires to be paid for within a period of two-and-a-half years.

Cheaper Gas at Wakefield.—The decision of the Wakefield Gas Company to allow consumers a discount of 1d. per 1000 cubic feet if they pay their accounts early has cost the Company nearly £1900 during the past year. After the next meter-taking, an additional 1d. per 1000 cubic feet is to be allowed; and these concessions will have the effect of bringing down the cost of the gas to 2s. 4d. per 1000 cubic feet.

Leyland Gas Company.—The Directors' report, recommending the payment of dividends at the rate of 6½ and 5 per cent. per annum, less income-tax, on the ordinary and preference shares, was passed at a meeting in Manchester, over which Mr. W. C. Buckley presided. Following the ordinary meeting, a special general meeting was held, when a resolution was passed authorizing the Company to promote a Bill in Parliament to extend the limits for the supply of gas, to empower the Company to supply electricity, to raise further capital, to change the name of the Company, and for other purposes. Additional stock is to be issued.

Among the joint-stock registrations recently notified is that of Messrs. Peckett and Sons, Limited, of the Atlas Locomotive Works, Bristol. The capital is £80,000 in £1 shares.

The decision of the Bradford Gas Committee to take premises in Darley Street, and use them as a show-room, has caused tradesmen in the city to utter a protest against the practice of municipal trading which is being carried on by the Corporation. They maintain that it is not fair for the authorities to compete with tradesmen who have to pay large rents and rates for the upkeep of the city.

The annual staff dinner of the Bryan Donkin Company was held on the 13th inst., at the Corn Exchange, Chesterfield. The chair was taken by the Managing-Director of the Company (Mr. George Clark), who was supported by two other Directors, Messrs. H. J. Donkin and A. G. Webb. The company present included the heads of departments, both in the offices and works, including the outdoor representative staff. The Chairman, in proposing the toast of "The Staff," alluded to the occasion as marking his "Coming of Age" in his connection with the Company, and then gave some interesting figures in reference to the development of business, both as to scope and quantity, during this period, particularly during the latter ten years. He also gratefully acknowledged the loyalty shown by all members of the staff.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ASSISTANT-ENGINEER. Cardiff Gaslight Company. Applications by March 2.
WORKS SUPERINTENDENT. No. 5849.
DRAUGHTSMEN. West's Gas Improvement Company, Manchester.
DRAUGHTSMAN. Gibbons Bros., Ltd., Dudley.
FOREMAN ENGINEWRIGHT. No. 5847.
REPRESENTATIVES. British Graetzin Light, Limited, 26-35, Chapter Street, Westminster.
COAL REPRESENTATIVES. No. 5844.
SALESMAN. No. 5846. Applications by March 4.

Appointment, &c., Wanted.

SALES MANAGER. No. 5850.

Financial Support Wanted.

MERCATOR, c/o Deacon's, Leadenhall Street, E.C.

Correspondence Classes.

FOR DISPOSAL. No. 5848.

Gas-Works Wanted.

"D. G.," c/o SCRIPPS'S, 13, South Molton Street, W.

Plant, &c. (Second-Hand), for Sale.

RETORTS. Newcastle Gas Company.
STEEL BUILDING. "G.," Titan Works, Charles Henry Street, Birmingham.

Plant (Second-Hand) Wanted.

PURIFIERS. Beaumont, Bow, E.

Patent Licences, &c.

MANTLE MAKING MACHINERY, &c. Haseltine, Lake, and Co., 28, Southampton Buildings, W.C.

Sales of Stocks and Shares.

BROADSTAIRS GAS COMPANY. London Mart. March 3.
CROYDON GAS COMPANY. By Tender. March 10.
GRAVESEND AND MILTON WATER COMPANY. London Mart. March 17.
GRAYS AND TILBURY GAS COMPANY. London Mart. March 17.
HARROW GAS COMPANY. London Mart. March 3.
LEA BRIDGE GAS COMPANY. London Mart. March 17.
SOUTH-WEST SUBURBAN WATER COMPANY. London Mart. March 3.

TENDERS FOR

Fire-Clay Goods.

BRIGHOUSE CORPORATION. Tenders by March 5.
HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by March 9.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 3.

General Stores (Sulphuric Acid, Oil, Paint, Tools, &c., Lime, Ironmongery, Lead Pipe, Iron, Brushes, Steel Goods, Castings, &c., Gas and Water Fittings, &c.).

BRIGHOUSE CORPORATION. Tenders by March 5.
HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by March 9.
INVERNESS GAS DEPARTMENT. Tenders by March 16.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 3.

Lighting Goods (Lamps, Columns, &c.).

LEICESTER WATCH COMMITTEE. Tenders by March 2.

Meters.

BRIGHOUSE CORPORATION. Tenders by March .
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 3.

Pipes, &c.

BRIGHOUSE CORPORATION. Tenders by March 5.
HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by March 9.
RHONDDA GAS AND WATER DEPARTMENT. Tenders by March 3.

Tar, Pitch, Benzol.

BRIGHOUSE CORPORATION. Tenders by March 5.
INVERNESS GAS DEPARTMENT. Tenders by March 16.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, FLEET LONDON." Telephone: 6857 Holborn.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
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Telegrams—
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J. BROWN & CO., LTD., Savile Town, DEWSBURY.
Scotland and Ireland:
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

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SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF." THE COOKER CLEANER.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works,
GRANT STREET, MILES PLATTING, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every Description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, Rose Mount Ironworks, Elland.

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CARBONIZING and Boiler Setting Engineers, Complete Installations undertaken. Their Retort Settings are THE best.

GUARANTEED RESULTS.

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London Office: 53, Victoria Street, S.W.
Telephone: 3512 Victoria.
Manchester Office: 55, Cross Street.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated Wm. Pearce & Sons, Ltd.
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Telegrams: "Hydrochloric, Fen. London."
Telephone: 1588 Avenue (3 lines).

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 10, p. 394.

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SPECIALLY prepared for Sulphate of AMMONIA Makers by

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Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Worcs.
Telegrams: "Chemicals, Oldbury."

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Telegrams: "Dacolight London." Telephone: 2336 Holborn.

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Prices and Designs on Application to
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London Office: 39, Victoria St., Westminster, S.W.

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Telegrams: "Chemicals."

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
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SIMULTANEOUS DISCHARGING-CHARGER.
The One Machine which Discharges and Charges at One Stroke.
See Advertisement, Feb. 10, p. II.
ALDRIDGE AND RANKEN,
39, Victoria Street, Westminster, S.W.
Telegrams: "Motorpathy London." Telephone: 5118 Victoria.

JOHN RILEY & SONS, Limited, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

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W. Canning and Co., Birmingham, and 18, St. John's Square, Clerkenwell, London.

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It is also used for the Enrichment of Gas.
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Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

PATENTS AND TRADE MARKS PUBLICATIONS: "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
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PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
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Manufacturers of
GAS METERS (ordinary and prepayment).
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"FALCON" INVERTED LAMPS, for street lighting.
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CARDIFF GASLIGHT AND COKE COMPANY.

ASSISTANT-ENGINEER.

APPLICATIONS are invited for the Position of ASSISTANT-ENGINEER to the above Company. Candidates to be over 28 years of Age, and Fully Qualified. Constructional and Management Experience of a Large Gas-Works essential. Some Practical Knowledge of the Vertical Retort System, also Distribution Work, Desirable.
Commencing Salary £300 per Annum.
Applications, stating Age, Experience, and Present Appointment, together with *copies* of Three Recent Testimonials, to be addressed to the Chairman, and forwarded, not later than March 2 next, to the undersigned, from whom Further Particulars may be Obtained.
Canvassing directly or indirectly will disqualify.

George Clarry,
General Manager and Secretary.

Cardiff,
Feb. 10, 1914.

GAS-COAL Representatives.—Large Firm of Factors require Two or Three for the Sale of Gas Coal, Cannel, &c.
None but Experienced Salesmen need Apply.
Apply, by letter, giving References and full Qualifications, to No. 5844, care of Mr. King, 11, Bolt Court, Fleet Street, E.C

ENGINEERS' Draughtsmen Wanted. Apply stating Age, Experience, and Salary required, to West's Gas Improvement Company, Limited, Albion Iron-Works, Miles Platting, Manchester.

WANTED, Experienced Draughtsman used to Detailing Retort-Bench Ironwork, Settings, and Structural Work.
Apply, stating Age, Experience, and Salary required, to Gibbons Bros., Ltd., Dibdale Works, Dudley, Worcs.

WANTED, a Smart Representative for the Sale of Graetzin Specialities in London District. Must be well known in the trade.
Apply, by letter only, giving all Particulars, to The British Graetzin Light, Limited, 26-36, Chapter Street, Westminster, S.W.

WANTED, a good Firm to Represent us in the West of England and Wales, for our Well-Known Graetzin Specialities.
Apply, by letter only, giving full Particulars, to The British Graetzin Light, Limited, 26-36, Chapter Street, Westminster, S.W.

GAS Engineer Working Successful Correspondence Classes, wishes to DISPOSE OF SAME after the Examinations next Month. Students Average 180 per Annum. Nearly 1000 names on Books. Unique opportunity for Gentleman having some spare time. Strictest investigation.
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Apply, by letter, stating Age and Qualifications, Wages required, together with References, to No. 5849, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

A COMPETENT Salesman required for a Gas Company opening up the Commercial and Fittings Business. The Applicant will be required to have a thorough Knowledge of Gas Sales in all Branches, and be competent to Quote and Recommend Suitable Schemes for Lighting, Heating, and Power Purposes, at the same time to Superintend the Company's Show-Room.
Salary, £200 per Annum.
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In replying, please give References and Experience, and also state Salary required.
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HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD.

THE above Gas Board are prepared to receive TENDERS for the Supply of the necessary SUNDRY STORES and FIRE-CLAY GOODS required at their Works for the Year ending March 31, 1915, including the following:—WROUGHT-IRON TUBES. OIL, PAINT, TOOLS, &c., RETORTS, FIRE-CLAY GOODS, &c.
Further Particulars and Form of Tender may be had from Mr. E. J. Wellens, Engineer and Manager, Carlton Street, Hebden Bridge.
Sealed Tenders, endorsed "General Stores" and "Fire-Clay Goods," to be addressed to the Chairman, Gas Board Offices, Carlton Street, Hebden Bridge, not later than Monday, March 9, 1914.

(Signed) R. Crabtree,
Clerk.

Gas Board Offices: Carlton Street,
Hebden Bridge, Feb. 16, 1914.